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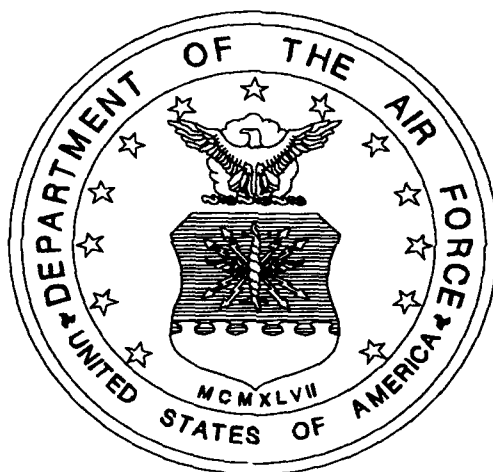


DEPARTMENT OF THE
AIR FORCE

SUPPORTING DATA FOR
FISCAL YEAR 1994

BUDGET ESTIMATE SUBMISSION

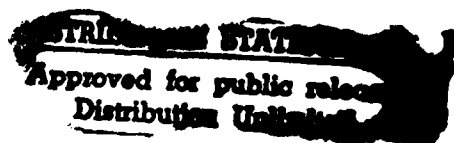
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DESCRIPTIVE SUMMARIES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION



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DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF
THE DEPARTMENT OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM
FY 1994 BUDGET ESTIMATES
APRIL 1993

INTRODUCTION AND EXPLANATION OF CONTENTS

1. (U) GENERAL. This document has been prepared to provide information on the United States Air Force (USAF) Research, Development, Test and Evaluation (RDT&E) program to Congressional committees during the Fiscal Year 1994 hearings. This information is in addition to the testimony given by DOD witnesses.

a. (U) The Descriptive Summaries provide narrative information to all RDT&E program elements and projects, except those listed in paragraph 4b, within the USAF FY 1994 RDT&E program. The formats and contents of this document are in accordance with the guidelines and requirements of the Congressional committees insofar as possible.

b. (U) The "RESOURCES" portion of the Descriptive Summaries includes, in addition to RDT&E funds, Procurement funds and quantities, Military Construction appropriation funds on specific development programs, Operations and Maintenance appropriation funds where they are essential to the development effort described, and, where appropriate, Department of Energy (DOE) costs.

c. (U) The section of the Fiscal Year 1994 Descriptive Summaries entitled "Facilities Exhibits" located in the back of the book contains information on major improvement to and construction of government owned facilities funded by RDT&E.

2. (U) COMPARISON OF FISCAL YEARS 1992 AND 1993 DATA. A direct comparison of Fiscal Years 1992 and 1993 data shown in this document with corresponding data in the Descriptive Summaries dated February 1992 will reveal differences. Many of the differences are attributable to the following:

a. (U) Fiscal Year 1993 funding changes as a result of Congressional action on the appropriation and/or proposed RDT&E reprogramming actions.

b. (U) Fiscal Year 1992 funding changes between October 1, 1991 and September 30, 1992 due to RDT&E reprogramming actions, Supplemental Appropriations, and rescissions.

c. (U) Reclassification of FY 1992 and FY 1993 data to achieve comparability with the program structure for Fiscal Year 1994.

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3. (U) Relationship of Fiscal Year 1994 budget structure to the Fiscal Year 1993 Budget approved by the Congress:

PROGRAM ELEMENT (PE)

REMARKS

0101142F KC-135 Squadrons
0207601F USAF Wargaming & Simulation
0303140F Information System Security

PE deleted in FY 94; efforts transferred to PE 0401218F.
New PE proposed for FY 94.
New PE proposed for FY 94.

Program

0303401F COMSEC
0303606F UHF Satellite Communications
0305181F Western Test Range
0305182F Eastern Test Range
0401218F KC-135

PE deleted in FY 94; efforts transferred to PE 0303140F.
New PE proposed for FY 94.
New PE proposed for FY 94; FY 93 & Prior O&M funded.
New PE proposed for FY 94; FY 93 & Prior O&M funded.
New PE proposed for FY 94; FY 93 & Prior funded in PE 0101142F

0602790F SBIR/STTR

New PE and new method of funding proposed starting in FY 94. FY 93 and prior funding for SBIR only, was funded in PE 0605502F, by pro-rata share taxing of other RDT&E programs.

0603319F Airborne Laser Technology
0604211F Adv Aerial Targets Dev
0604256F Threat Simulator Development
0604258F Target Systems Development
0604747F Electromag Radiation Test Fac
0604755F Imp Cap for RDT&E
0604759F Major T&E Investment

New PE proposed for FY 1994.
PE deleted in FY 94; efforts transferred to PE 0604258F
New PE proposed for FY 1994.
New PE proposed for FY 1994.
PE deleted in FY94; efforts transferred to PE 0604256F.
PE deleted in FY94; efforts transferred to PE 0604759F.
New PE proposed for FY94; FY93 & Prior funded in PE 0604755F.

0708011F Industrial Preparedness
0708054F Pollution Prevention
0804734F Crypto/SIGINT Related Skill Tng
0901600F Contract Admin/Audit

FY 94 & out funded in OSD account.
New PE proposed for FY 94.
New PE proposed for FY 94.
New PE proposed for FY 94.

4. (U) CLASSIFICATION.

a. (U) Classified pages bear the appropriate security classification. Classified data is identified by use of brackets { }.

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6	Human Systems Technology	0602202F	252
7	Aerospace Propulsion	0602203F	261
8	Aerospace Avionics	0602204F	267
9	Personnel, Training, and Simulation	0602205F	280
10	Civil Engineering & Environmental Quality	0602206F	285
11	Rocket Propulsion and Astronautics Technology	0602302F	288
12	Advanced Weapons	0602601F	293
13	Conventional Munitions	0602602F	298
14	Command, Control, and Communications	0602702F	303
15	Small Business Innovative Research/Small Business Technology Transfer Pilot Program (SBIR/STTR)	0602790F	310
16	Logistics Systems Technology	0603106F	314
17	Advanced Materials for Weapon Systems	0603112F	318
18	Aircraft Propulsion Subsystem Integration (APSI)	0603202F	322
19	Advanced Avionics for Aerospace Vehicles	0603203F	325
20	Aerospace Vehicle Technology	0603205F	333
21	Aerospace Structures	0603211F	337
22	Aerospace Propulsion and Power Technology	0603216F	340
23	Personnel, Training, and Simulation Technology	0603227F	348
24	Crew Systems and Personnel Protection Technology	0603231F	352
25	Global Surv/Air Defense/Precision Strike Tech Demo	0603238F	357
26	Advanced Flight Technology Integration (AFTI)	0603245F	363
27	Lincoln Laboratory	0603250F	367
28	Advanced Avionics Integration	0603253F	370
29	National Aero-Space Plane (NASP) Technology Program	0603269F	382
30	Electronic Combat Technology	0603270F	386
31	Space and Missile Rocket Propulsion	0603302F	392
32	Ballistic Missile Technology	0603311F	397
33	Airborne Laser Technology	0603319F	403
35	Advanced Spacecraft Technology	0603401F	405
36	Space Systems Environmental Interactions Technology	0603410F	416
38	Conventional Weapons Technology	0603601F	423
39	Advanced Radiation Technology	0603605F	430
40	Weather Systems Technology	0603707F	445
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50	B-2 Advanced Technology Bomber	0604240F	532
52	System Survivability (Nuclear Effects)	0604711F	631
54	Advanced Cruise Missile	0101120F	1
56	Minuteman Squadrons	0101213F	5
61	Joint Surveillance System (JSS)	0102325F	18
62	Surveillance Radar Stations/Sites	0102411F	21
63	Distant Early Warning (DEW) Radar Stations	0102412F	24
69	Minimum Essential Emergency Communications Network	0303131F	106
71	Milstar Satellite Communications Systems (AF Terminals)	0303601F	118
73	UHF Satellite Communications	0303606F	125
75	Arms Control	0305145F	150
77	Western Range	0305181F	168
78	Eastern Space Launch Facility	0305182F	170
80	Improved Space-Based TW/AA	0305905F	174
81	NCMC-TW/AA System	0305906F	177
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103	Advanced Interdiction Aircraft (AX)	0604242F	539
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116	Common Support Equipment Development	0604704F	613
117	Life Support Systems	0604706F	618
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120	Surface Defense Suppression	0604733F	637
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122	Intelligence Equipment	0604750F	653
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125	Joint Surveillance/Target Attack Radar System (JSTARS)	0604770F	671
126	Joint Interoperability of Tact Command & Control Sys	0604779F	676
127	F-111 Squadrons	0207129F	26
130	F-16 Squadrons	0207133F	31
131	F-15E Squadrons	0207134F	37
132	Manned Destructive Suppression	0207136F	41
134	F-117A	0207141F	44
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0303601F	Milstar Satellite Communications Systems (AF Terminals)	71	118
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0604249F	Night/Precision Attack	104	544
0604222F	Nuclear Weapons Support	98	488
0305913F	NUDET Detection System	86	197
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0604735F	Range Improvement	193	640
0605863F	RDTE Aircraft Support	205	709
0602302F	Rocket Propulsion and Astronautics Technology	11	288
0303605F	Satellite Communications Terminals	157	122
0305110F	Satellite Control Network (SCN)	211	127
0603438F	Satellite Systems Survivability	184	420
0207590F	SEEK EAGLE	151	87
0602790F	Small Business Innovative Research/Small Business Technology Transfer Pilot Program (SBIR/STTR)	15	310
0603302F	Space and Missile Rocket Propulsion	31	392
0603410F	Space Systems Environmental Interactions Technology	36	416
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0305910F	SPACETRACK	83	185
0604233F	Specialized Undergraduate Pilot Training (SUPT)	100	519
0604604F	Submunitions	111	595
0604733F	Surface Defense Suppression	120	637
0102411F	Surveillance Radar Stations/Sites	62	21
0604711F	System Survivability (Nuclear Effects)	52	631
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0605807F	Test and Evaluation Support	202	693
0207438F	Theater Battle Management (TBM) C4	149	84
0604256F	Threat Simulator Development	188	550
0305144F	Titan IV Acquisition	215	146
0604227F	Training Systems Development	186	501
0303606F	UHF Satellite Communications	73	125
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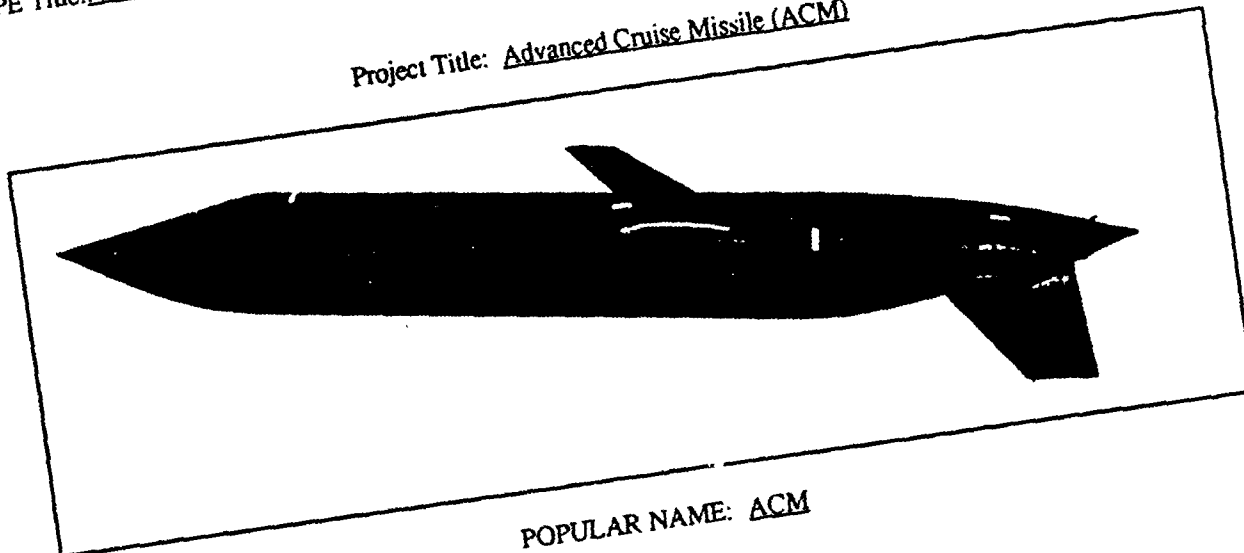
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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Budget Activity: #3 - Strategic Programs

Program Element: #0101120F
PE Title: Advanced Cruise Missile

Project Title: Advanced Cruise Missile (ACM)



POPULAR NAME: ACM

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	(To Complete)
Program Milestones				
Engineering Milestones				
T&E Milestones	FOT&E II			
Contract Milestones	FY 90/91/ 92 BUY			
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	28,646	13,019	21,374	75,439 (12,400)
Support Contract	6,574	2,313	885	9,772 (0)
In-House Support	3,408	4,011	3,134	15,053 (4,500)
GFE/Other	672	200	0	872 (0)
Total	39,300	19,543	25,393	100,264 (16,028)

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Program Element: #0101120F
PE Title: Advanced Cruise Missile

Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The ACM is a low-observable, air-launched, strategic cruise missile with significant improvements in range, accuracy, and survivability over the ALCM-B. Armed with a W-80 warhead, it is designed to counter air and ground-based defenses in order to strike heavily defended, hardened targets at any location within the territory of any potential enemy. The ACM is designed for external carriage on the B-52H.

(U) TECHNICAL PERFORMANCE PARAMETERS:

- (S) Operational Range -
- (S) Maximum Standoff Launch -
- (S) High Altitude Launch -
- (S) Low Altitude Launch -
- (S) System Accuracy (CEP) -

C.(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1.(U) FY 1992 Accomplishments:

- (U) Terminated Variant
- (U) Began FOT&E Phase II Testing

2.(U) FY 1993 Planned Program:

- (U) Activate Minot AFB with ACM
- (U) Complete Avionics Depot Development
- (U) Complete Production

3. (U) FY 1994 Planned Program:

- (U) Complete Radar Cross Section (RCS) Depot Development
- (U) Complete Ordnance Depot Development

4. (U) Program to Completion:

- (U) Complete Guidance Depot Development
- (U) Complete Sensor Depot Development
- (U) Complete Software Depot Development

D. (U) Work Performed By:

(U) General Dynamics Corporation/Convair Division (GD/C), San Diego, CA, was selected as the prime contractor in mid-April 1983. GD/C was sold to Hughes Aircraft Company in August 1992. Contracts for the engine (Williams International, Ogden, UT) and aircraft integration (B-52 and the Common Strategic Rotary Launcher [CSRL]: Boeing-Wichita) were subsequently awarded. Congress supported, and the Air Force instituted, a second source (McDonnell Douglas Missile Systems Company, Titusville, FL).

(U) The ACM underwent a combined Developmental and Operational Test and Evaluation program that was completed in July 1990. The 31st Test and Evaluation Squadron (SAC), in conjunction with the 6510th Test Wing (AFFTC) was the responsible test agency. The Systems Program Office (ASC/VC) will provide management and supply support until the depot item manager for the ACM system at Oklahoma City Air Logistics Center (OC-ALC) is able to accept management responsibility.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: There have been no major technical changes.

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Program Element: #0101120F
PE Title: Advanced Cruise Missile

Budget Activity: #3 - Strategic Programs

2. (U) Schedule Changes: Deliveries began in July 1990. They were subsequently stopped in April 1991 for problems with fuel leaks/odors, water intrusion, wing deployment actuator leak, and overall quality. Missile deliveries were resumed in Nov 1991. The DAB IIIB decision was rescheduled from February 1991 to July 1991. The President directed that the ACM procurement be stopped after the FY92 buy at a total of 640 missiles. Subsequent Congressional budget rescission reduced the quantity to 460 missiles. Last delivery now expected in FY 93.
3. (U) Cost Changes: Outyear funding changed as a result of Congressional rescission and President's Strategic Initiative. RDT&E funds adjusted to fund completion of organic depot development. Procurement funding increased for deferred tasks and interim contractor support until depots are complete.

F.(U) PROGRAM DOCUMENTATION:

- (U) SAC Statement of Need, dated Aug 82
- (U) Acquisition Program Baseline, dated Aug 91
- (U) LRIP (Sufficiency Review), dated Jul 86
- (U) Statement of Need, dated Mar 87
- (U) ACM Integrated Logistics Support Plan, dated Apr 92
- (U) ACM Test and Evaluation Master Plan, dated Jan 90
- (U) System Operational Requirements Document (SORD) for ACM, dated Nov 90
- (U) System Threat Assessment Report (STAR) for ACM, dated Mar 90.

G. (U) RELATED ACTIVITIES:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Procurement (460 Missiles)

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Cost	198,255	104,047	59,652	40,672	3,013,100

(U) Military Construction

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Cost	0	1,254	0	0	1,254

I. (U) COOPERATIVE AGREEMENTS: Not Applicable

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Program Element: #0101120E
 PE Title: Advanced Cruise Missile

Budget Activity: #3 - Strategic Programs

I.(U) TEST AND EVALUATION DATA:T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
(U) B-52 Captive Flights	Sep 90	Completed
(U) Demo	Jan 89	Fully Successful
(U) Demo	Jul 89	Fully Successful
(U) Functional Ground Testing	Jun 89	Completed
(U) Measurement	Jun 90	Completed
(U) Missile Environmental Test	Jul 90	Successful
(U) MDMSC Free Flights	Sep 90	2 of 2 Successful

T&E ACTIVITY (PAST 36 MONTHS - CONTINUED)

(U) Dual Source Qualification Test	Dec 90	Completed
(U) Measurement	Dec 91	Completed
(U) Multifunctional Ground Test	Jul 92	3 of 3 Successful

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
(U) FOT&E II Flight Testing	Ongoing	Ongoing

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0101213F
 PE Title: Minuteman Squadrons

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ In Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
133B Rapid Execution and Combat Targeting	41,948	15,712	26,147	TBD	280,150
3085 Guidance Replacement Program	0	*0	87,425	264,780	407,264
4208 Reentry System Launch Program	11,776	8,520	16,336	Cont	Cont
4209 Long Range Planning	3,973	2,518	4,487	Cont	Cont
4210 Propulsion Replacement Program	0	0	49,940	131,656	181,596
TOTAL	57,697	27,750	184,335	TBD	TBD

* \$50.4M funded from PE 0604312F, ICBM Modernization.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Ongoing Minuteman life extension efforts emphasize extending the Minuteman III ICBM weapon system beyond 2020. DoD directed the Air Force to expand its effort to extend the life of the Minuteman III. This effort was validated and reported in the OSD Minuteman III Life Extension Report to Congress.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) 4209. Long Range Planning: The Long Range Planning (LRP) task examines Minuteman subsystem modification options required to meet user objectives for system life extension. LRP plans, studies and projects focus on operability, supportability and maintainability considerations. Options are evaluated for implementation, schedule, and cost issues.

(U) FY 1992 Accomplishments:

- (U) Converted radiographic fault detection data for non-destructive test and evaluation into data consistent with currently installed computed tomography hardware.
- (U) Supported Long Range Planning (LRP) tasks.
- (U) Evaluated and defined interface requirements for existing guidance efforts for possible use as Minuteman Pre-Planned Product Improvement (P3I).
- (U) Evaluated emerging "clean" propellants for use in Minuteman. The goal was to reduce the cost to manufacture and dispose of propellant and significantly reduce environmental impact during static and flight test operations.

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Program Element: # 0101213F
PE Title: Minuteman Squadrons

Budget Activity: #3 - Strategic Programs

(U) FY 1993 Planned Program:

- (U) Continue work on radiographic fault detection. Provides capability to automatically evaluate electronic "motor pictures" for anomalous conditions. Provides capability to interface with computed tomography equipment previously purchased by the Air Force.
- (U) Support Long Range Planning tasks. Produce Weapon System Master Plan, a summary of all efforts required to maintain ICBM weapon systems for the next 20 years.
- (U) Support the joint DOD/DOE phase II DOE warhead options study as directed by the SECAF in response to the Drell Committee report.
- (U) Continue technology insertion studies. Update the Systems Options Report. This report evaluates other DoD, service, and industry technical efforts and reports to determine applicability to ICBM requirements.
- (U) Evaluate the feasibility of deploying the MK21 on the Minuteman III.

(U) FY 1994 Planned Program:

- (U) Continue work on radiographic fault detection.
- (U) Support Long Range Planning tasks (produce Weapon System Master Plan).
- (U) Continue warhead options studies.
- (U) Continue technology insertion studies and update the Systems Options Report.
- (U) Review developing technology of solid state inertial instruments.
- (U) Study the use of Global Positioning System telemetry in support of Follow-on Operational Test and Evaluation Launches.
- (U) Perform cost benefit trade study for communications uplink capability for Airborne Launch Control Center.
- (U) Individual program efforts conducted in FY94 are in direct support of presidentially directed Minuteman III life extension.

(U) Program to Completion:

- (U) Complete work on radiographic fault detection.
- (U) Complete warhead options studies.
- (U) Continue technology insertion studies and update the Systems Options Report.

(U) Work Performed By: The Silo-Based ICBM SPO, Hill AFB, UT, is the responsible agency for this program.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands): Not Applicable.

(U) International Cooperative Agreement: Not Applicable.

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Capt Avance/ SAF/AQQS(M)/ 7-8123/ 12 Apr 93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0101213F
 PE Title: Minuteman Squadrons

Project Number: 133B
 Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
REACT	41,948	15,712	26,147	5,550	286,900

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Minuteman Launch Control Centers (LCCs) have been deployed since the early 1960's. Since the original deployment, numerous communications and weapon system modifications have been installed on a stand-alone basis without consideration for human engineering interfaces and space limitations of the Minuteman LCC. Additional communications requirements and changes in crew procedures have, over time, resulted in task saturation of the crew members. AFMC studies show that the Weapon System Control Element (WSCE) is reaching the end of its useful life. Manufacturers no longer produce many of the replacement parts and computer memory capacity has reached its limits. The Rapid Execution and Combat Targeting (REACT) program was initiated in 1988 to correct these concerns. The program combines five related efforts into one to improve maintainability, supportability, responsiveness and operability of the weapon system: Weapon System Controller (WSC) hardware replacement, Rapid Message Processing (RMP), rapid retargeting software, Launch Control Center console integration, and Missile Procedures Trainer (MPT) computer replacement. The program will modify Minuteman LCCs and associated trainers. The new WSCE provides significantly increased system capacity and eliminates supportability difficulties presented by the current aging WSC. The RMP element and rapid retargeting will streamline current procedures and provide greater flexibility for crew members responding to critical National Command Authority directives. The MPT modification will reflect current operational configurations and allow crew members to receive maximum benefit from training time.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments:

- (U) Completed Critical Design Reviews (CDRs).
- (U) Completed targeting software FCA/PCA.
- (U) Began system level integration testing and weapon system testing.
- (U) Completed hardware/software qualification test of AM system LCC configuration.
- (U) Completed installation of REACT modification of AM system Test Bed at Hill AFB.
- (U) Exercised first WSCE production option for an additional 28 sites.
- (U) Exercised second Communication Element production option for 25 sites.

2. (U) FY 1993 Planned Program:

- (U) Conduct functional and configuration audits (FCA/PCA) of the REACT Communications Element.
- (U) Complete restructure of contracts to delete Peacekeeper requirements.
- (U) Conduct WSCE hardware/software FCA/PCAs.
- (U) Complete installation and checkout of first test site at VAFB.
- (U) Exercise second WSCE production option for the final 20 sites.

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Program Element: # 0101213F

Project Number: 133B

PE Title: Minuteman Squadrons

Budget Activity: #3 - Strategic Programs

- (U) Exercise third Communications Element production option for final 19 sites.

3. (U) FY 1994 Planned Program:

- (U) Deliver Interactive Decode (Rapid Message Processing) capability in Communications Element.
- (U) Conduct maintainability demonstration.
- (U) Begin Initial Operational Test and Evaluation (IOT&E).
- (U) Complete WSCE AM system software FCA/PCA.
- (U) Begin WSCE B system software FCA/PCA.
- (U) Obtain nuclear certification of REACT AM system software.
- (U) Complete first installation and conduct technical acceptance demonstration of Missile Procedures Trainer (MPT).
- (U) Complete depot activation.
- (U) Begin weapon system installation and checkout leading to First Asset Delivery (FAD).
- (U) Complete formal weapon system test.

4. (U) Program to Completion:

- (U) Achieve Last Asset Delivery (LAD).

D. (U) WORK PERFORMED BY: Loral Command and Control Systems was awarded the Weapon System Control Element (WSCE) portion of the REACT contract, overseen by Silo Based ICBM SPO. GTE was awarded the REACT Communications Element, overseen by Electronic Systems Division (ESD). The responsible Air Force agency for the overall project is AFPEO/ST.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Rapid Message Processing requirement has been satisfied by incorporating Interactive Decode capability into the Communications Element in lieu of the canceled Automated Emergency Action Message Processing and Dissemination System (AEPDS).
2. (U) SCHEDULE CHANGES: FAD in 4Q 1993 is not achievable. Preliminary restructuring of the program is being developed in order to meet a FAD of Jul 1994. Final restructuring and rebaselining options will be presented to the PEO and ACC for decision in May 1993.
3. (U) COST CHANGES: Preliminary restructuring of the program is being developed in order to meet a FAD of Jul 1994. Final restructuring and rebaselining options will be presented to the PEO and ACC for decision in May 1993.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 6-85, ICBM Rapid Message Processing and Retargeting, 22 August 86.
- (U) SAC SON 14-86, ICBM Launch Control Center Integration, 8 November 87.
- (U) SAC ROC 2-75, Ground Wave Emergency Network.
- (U) SAC ROC 6-70, Milstar.
- (U) SAC SORD 14-86-I/II (Revised), Rapid Execution and Combat Targeting, 15 April 91.

G. (U) RELATED ACTIVITIES:

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Missile Procurement (BA 4):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	*126,400	107,600	7,600	TBD	328,050

* Note: \$12.0M of the \$126.4M is contained in PE 0305145F, Arms Control for single RV software modifications required by START

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Program Element: # 0101213F

Project Number: 133B

PE Title: Minuteman Squadrons

Budget Activity: #3 - Strategic Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|--|------------|
| 1. (U) Full Scale Development (FSD) contract award | Apr 1989 |
| 2. (U) System Design Review (SDR) | Jul 1989 |
| 3. (U) Preliminary Design Review (PDR) | Mar 1990 |
| 4. (U) Critical Design Review (CDR) | Mar 1991 |
| 5. (U) Production Contract Award (WSCE) | Jul 1991 |
| 6. (U) First Asset Delivery (FAD) | (Jul 1994) |
| 7. (U) Last Asset Delivery (LAD) | (Jan 1996) |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 11213F
 PE Title: Minuteman Squadrons

Project: 3085
 Budget Activity: #3 - Strategic Programs

Project Title: Minuteman III Guidance Replacement Program

PHOTOGRAPH NOT AVAILABLE

POPULAR NAME: Minuteman III Guidance Replacement Program

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

<u>SCHEDULE*</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To Complete</u>
Program Milestones	N/A	AFSARC Milestone II Jul 93	N/A	First Asset Delivered 4Q FY97
Engineering Milestones	N/A	SRR Aug 93	SDR 4QFY93 PDR 4QFY94	FCA 2Q FY97 PCA 3Q FY97
T&E Milestones	N/A	N/A	N/A	First Flight Test 1Q FY97
Contract Milestones	N/A	EMD Contract Award Jul 93	N/A	Low Rate Init Production Contract 4Q FY96
<u>BUDGET *</u> <u>(\$000)</u>	<u>FY 1992</u>	<u>FY 1993**</u>	<u>FY 1994</u>	<u>Program Total</u> <u>(To Complete)</u>
Major Contract	0	34,445	69,693	328,515 (224,377)
Support Contract	0	12,590	12,150	52,370 (27,630)
In-House Support	0	3,323	5,582	38,715 (29,810)
GFE/Other	0	0	0	0
Total	0	50,358	87,425	419,600 (281,817)

* Schedule and Budget are for Phase 1 Guidance Electronics Modernization only.

** The FY93 budget is allocated against PE 64312F (ICBM Modernization). FY94 and beyond budget allocated against PE 11213F (Minuteman Squadrons).

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Program Element: # 11213F
PE Title: Minuteman Squadrons

Project: 3085
Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

As a result of various arms control agreements, the Minuteman III is projected to become the only ICBM leg of the TRIAD when Minuteman II and Peacekeeper are retired. Ongoing Minuteman Life Extension efforts are required to extend the life of the Minuteman III to the year 2020. These efforts were defined in OSD's Minuteman III Life Extension Report to Congress, which was submitted on July 29, 1992. The Joint Requirements Oversight Council validated the Mission Need Statement for a Future Guidance System for Intercontinental Ballistic Missiles on November 5, 1992. The Guidance Replacement Program (GRP) replaces/upgrades the Minuteman III (NS-20) guidance set using a two-phased approach. GRP Phase 1 replaces 1960's guidance system electronics and implements the flexibility to configure the missile with the Mark 21/W87 warhead, if required. The guidance electronics components must be replaced since current electronics components continue to degrade and are projected to become unreliable as early as 1997 and unsupportable as early as 1998. Contract award is projected for July 1993. GRP Phase 2 develops and produces a replacement IMU for the Minuteman III. It is required to provide alert posture flexibility by providing an option for a semi-dormant mode of operation, replacement for Peacekeeper accuracy, and to serve as a hedge against unforeseen catastrophic failure of the Submarine Launched Ballistic Missile (SLBM) fleet. Although no funding or schedule have been established for Phase 2, development could begin as early as 1995.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments: Not Applicable.
2. (U) FY 1993 Planned Program:
 - (U) Award Phase 1 Engineering and Manufacturing Development (EMD) contract and system support contracts.
 - (U) Conduct System Requirements Review (SRR).
 - (U) Begin system requirements analysis and commence hardware and software development.
 - (U) Begin common parts studies/development work on radiation hardened parts.
 - (U) Begin nuclear certification design analysis.
 - (U) Award Nuclear Surety Cross Check Analysis/Independent Validation and Verification (NSCCA/IV&V) contract.
3. (U) FY 1994 Planned Program:
 - (U) Continue Phase 1 hardware and software development.
 - (U) Begin fabrication of engineering models.
 - (U) Conduct System Design Review (SDR) and Preliminary Design Review (PDR).
 - (U) Begin Developmental Test and Evaluation.
4. (U) Program to Completion:
 - (U) Conduct Phase 1 QT&E/QOT&E.
 - (U) Begin Phase 2 EMD.
 - (U) Complete Phases 1 and 2 EMD.
 - (U) Phase 1 deployment begins 4QFY97 and concludes in FY01.

- D. (U) WORK PERFORMED BY: The program is managed by the Silo-Based ICBM System Program Office at Hill Air Force Base, UT. Pre-EMD contractors for GRP include TRW, San Bernadino, CA, and Charles Stark Draper Laboratory (CSDL), Cambridge, MA. Facilities at Hill AFB, Sandia Labs and Kirtland AFB will be used for integration and nuclear hardness testing. The Phase 1 EMD and NSCCA/IV&V contractors will be selected through full and open competition.

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Program Element: # 11213F
PE Title: Minuteman Squadrons

Project: 3085
Budget Activity: #3 - Strategic Programs

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: N/A
2. (U) SCHEDULE CHANGES: GRP Phase 2 EMD contract award was deleted from the FY95 Planned Program during the FY94 budget review process.
3. (U) COST CHANGES: FY93 RDT&E decrease of \$3.5M due to assessments. FY94 RDT&E decrease of \$12.7M due to assessments and reduction during FY94 budget review process. Decrease in the "To Complete" RDT&E column is due to the deletion of GRP Phase 2 funding. Procurement funding decrease reflects the deletion of GRP Phase 2 procurement funding. Procurement quantity increase due to better requirements definition.

F. (U) PROGRAM DOCUMENTATION:

- (U) AFLC SON 001-90, Improved Reliability/Maintainability Advanced Guidance System for ICBMs, 15 Apr 91.
- (U) CAF MNS 356-92, Future Guidance System for Intercontinental Ballistic Missiles, 20 Oct 92.

G. (U) RELATED ACTIVITIES:

(U) An inertial measurement unit (IMU) is being developed in the Advanced Inertial Measurement System (AIMS) Advanced Technology Transition Demonstration (ATTD) program (PE 63311F). The AIMS is a promising candidate for GRP Phase 2.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Missile Procurement (BA 03):

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>FY 1995</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Cost *	0	0	0	0	1,129,000	1,129,000
Quantities *	0	0	0	0	652	652

* Funding is for Phase 1 Guidance Electronics Modernization only.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

<u>Event</u>	<u>T&E ACTIVITY (PAST 36 MONTHS)</u>	
	<u>Date</u>	<u>Results</u>
	Not Applicable	

<u>Event</u>	<u>T&E ACTIVITY (TO COMPLETION)</u>	
	<u>Date</u>	<u>Results</u>

The Test and Evaluation Master Plan (TEMP) is in coordination. Once approved, a test schedule can be provided.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0101213F Project Number: 4208
 PE Title: Minuteman Squadrons Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
Reentry System Launch Program	11,776	8,520	16,336	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Reentry Systems Launch Program (RSLP) is the single agency tasked to provide launch vehicle support to DoD and other government agencies. RSLP was established by the Secretary of Defense in 1972. It provides mission planning, payload integration, launch support, booster storage and disposal, maintenance and logistics support for DoD Research and Development launches. Costs directly attributable to a specific launch or program are paid by the users (Air Force, Navy, Army, Strategic Defense Initiative Organization, etc.). RSLP directly supports deactivation of Minuteman II by providing storage of these and other assets as well as continued development of the Multiservice Launch System (MSLS). MSLS will provide a cost effective guidance system for retired Minuteman I, II and/or III missiles.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Researched, developed, acquired, stored and maintained test launch vehicles, motors, components, facilities and capabilities in support of projected government user requirements.
- (U) Provided necessary storage requirements for deactivated Minuteman II and other missile flight test assets.
- (U) Awarded contract for the development of the Multiservice Launch System (MSLS) that will provide a cost effective guidance system for Air Force and DoD flight test requirements.
- (U) Provided assets and technical support for eight SDIO R&D launches.
- (U) Launched three Minuteman boosters for SDIO.

2. (U) FY 1993 Planned Program:

- (U) Research, develop, acquire, store and maintain test launch vehicles, motors, components, facilities and capabilities in support of projected government user requirements.
- (U) Provide necessary storage requirements for deactivated Minuteman II and other missile flight test assets.
- (U) Continue development of the MSLS to support Air Force and DoD flight test requirements.
- (U) Provide launch assets and technical assistance for all DoD RDT&E launches.
- (U) Award contract to modify Minuteman II, Stage II nozzles to allow for use in sounding rocket missions.

3. (U) FY 1994 Planned Program:

- (U) Research, develop, acquire, store and maintain test launch vehicles, motors, components, facilities and capabilities in support of projected government user requirements.

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Program Element: # 0101213F
PE Title: Minuteman Squadrons

Project Number: 4208
Budget Activity: #3 - Strategic Programs

- (U) Provide necessary storage requirements for deactivated Minuteman II and other missile flight test assets.
- (U) Continue MSLS development.
- (U) Provide launch assets and technical assistance for all DoD RDT&E launches.
- (U) Award follow-on contract to modify Minuteman II, Stage II nozzles to allow for use in sounding rocket missions.

5. (U) Program to Completion:

- (U) RSLP is a continuing program.

D. (U) WORK PERFORMED BY: Martin-Marietta, Denver, CO, is the Multiservice Launch Systems (MSLS) contractor. MSLS provides cost effective guidance systems, including off-the-shelf guidance and control, telemetry and launch services to accommodate a variety of DoD mission requirements. Boeing provides facility maintenance and silo launches of Minuteman ICBMs with the original weapon system guidance and launch support equipment. Orbital Sciences (Space Data Division) provides the ICBM "front section," payload deployment system, sounding rocket hardware integration and launch services. TRW provides systems engineering and targeting support. Rockwell (Autonetics) provides guidance and control technical support. Pueblo Army Depot will assist with temporary storage of Minuteman II second and third stages until Navajo modifications are complete.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: N/A
2. (U) SCHEDULE CHANGES: N/A
3. (U) COST CHANGES: \$8.6M added in FY94 for MM II deactivation, storage, and support costs.

F. (U) PROGRAM DOCUMENTATION:

- (U) N/A

G. (U) RELATED ACTIVITIES:

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Military Construction (for Minuteman II storage):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	5,000	3,900	7,250	0	16,500

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) N/A

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0101213F
 PE Title: Minuteman Squadrons

Project: 4210
 Budget Activity: #3 - Strategic Programs

Project Title: Minuteman III Propulsion System Replacement Program

PHOTOGRAPH NOT AVAILABLE

POPULAR NAME: Minuteman Propulsion Program

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

<u>SCHEDULE</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To Complete</u>
Program Milestones	N/A	N/A	Milestone II Review 11/93	Production Approval 2Q/FY97
Engineering Milestones	N/A	N/A	EDR 1/94, then every other month	PDR 1Q/FY95 CDR 2Q/FY96 PCA 4Q/FY97 PCA 2Q/FY98
T&E Milestones	N/A	N/A	Static Motor Firing 4/94	Test Flights 1-3 First Qual Test 3Q/FY96
Contract Milestones	N/A	N/A	Award Contract 12/93	Advance Buy Sched. Protection 4Q/FY96
<u>BUDGET (\$000)</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>Program Total (To Complete)</u>
Major Contract	N/A	N/A	49,490	178,662 (129,172)
Support Contract	N/A	N/A	450	2,934 (2,484)
In-House Support	N/A	N/A	0	0
GFE/Other	N/A	N/A	0	0
Total	N/A	N/A	49,940	181,596 (131,656)

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Program Element: # 0101213F
PE Title: Minuteman Squadrons

Project Number: 4210
Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Due to established age-out of the motor case liner material and other age-related degradations, namely propellant cracking and propagation, and case corrosion, remanufacture of the Minuteman propulsion system must begin by 1997 to allow initial fielding prior to operational motors aging out. In order to support the production and replacement schedules, technology insertion efforts must begin in 1994 to replace materials no longer available or environmentally acceptable, develop efficient, environmentally sound manufacturing and waste disposal processes, reduce life cycle costs, reduce schedule and cost risk, and sustain the solid rocket motor industrial base to support Minuteman III life extension. This project incorporates only those necessary changes that can be demonstrated in an appropriate time frame, to ensure the Minuteman III propulsion system continues to meet current performance characteristics and remains both viable and supportable through 2020. Due to the fact that Minuteman III will be the sole remaining ICBM, this program will be structured and conducted to maintain a low risk approach.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) The Propulsion Replacement Program is a FY94 new start.

2. (U) FY 1993 Planned Program:

- (U) The Propulsion Replacement Program is a FY94 new start.

3. (U) FY 1994 Planned Program:

- (U) The Propulsion Replacement Program must begin in FY94 in order to support Minuteman III life extension, reduce schedule and cost risk, and conduct necessary technology insertion efforts mentioned above.
- (U) Reliability, environmental, and manufacturing issues for Stages 1, 2, and 3 will be initiated.
- (U) Tasks include component reuse studies, materials replacement studies, tooling redesign/refurbishment, Stage 3 case materials substitution, fabrication and testing of change verification motors, and order long-lead materials for the manufacture of change verification motors for FY95.
- (U) Change verification motors will be manufactured and tested.

4. (U) Program to Completion:

- (U) Final qualification of materials, processes, and motor design is completed in FY97.
- (U) Production will start in FY97 at a rate of one per-month and will increase to 5 motors a month by 4QFY98.

D. (U) WORK PERFORMED BY: Thiokol, Brigham City, UT, was the original and only manufacturer of the stage 1 motor. Aerojet, Sacramento, CA, is the current qualified manufacturer of the Stage 2 motor. United Technologies, San Jose, CA, is the current qualified manufacturer of the Stage 3 motor.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: N/A
2. (U) SCHEDULE CHANGES: N/A
3. (U) COST CHANGES: RDT&E FY94 funding was reduced due to assessments and a resolution during the FY94 budget review process.

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Program Element: # 0101213F
 PE Title: Minuteman Squadrons

Project Number: 4210
 Budget Activity: #3 - Strategic Programs

F. (U) PROGRAM DOCUMENTATION:

(U) ACC MNS CAF 318-92 (In Coordination).

G. (U) RELATED ACTIVITIES:

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Missile Procurement (BA 03):

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Cost	0	0	0	2,136,000	2,136,000

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.J. (U) TEST AND EVALUATION DATA:

<u>Event</u>	<u>T&E ACTIVITY (PAST 36 MONTHS)</u> <u>Date</u>	<u>Results</u>
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Not Applicable

<u>Event</u>	<u>T&E ACTIVITY (TO COMPLETION)</u> <u>Date</u>	<u>Results</u>
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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102325F
 PE Title: Joint Surveillance System (JSS)

Budget Activity: #3 - Electronics and Tele-communications Equipment

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2976 Joint Surveillance System (JSS) Connectivity	3,958	669	698	Continuing	TBD
2996 FAA/Air Force Radar Replacement (FARR)	3,987	4,016	2,693	Continuing	TBD
Total	7,945	4,685	3,391	Continuing	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Joint Surveillance System provides command, control and communications (C3) capability in support of NORAD's Atmospheric Tactical Warning and Attack Assessment (ATW/AA), air sovereignty, and air defense requirements. The Joint Surveillance System (JSS) Connectivity program provides improvements to this capability by integrating new sensor data and enhancing communications capabilities via the Advanced Interface Control Unit (AICU). The FAA/Air Force Radar Replacement (FARR) program will replace 39 existing JSS radars with solid-state, three-dimensional ARSR-4 radars to improve mission performance and reduce operation and maintenance costs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project Number: 2976. Project Title: Joint Surveillance System - Connectivity:
 The Joint Surveillance System Connectivity provides improvements to ATW/AA, air sovereignty, and air defense C3 by integrating new sensor data and enhancing communications capabilities.
 - (U) FY 1992 Accomplishments:
 - (U) Began Advanced Interface Control Unit (AICU) testing.
 - (U) Installed Block A at two CONUS Sector Operation Control Centers (SOCCs).
 - (U) Conducted studies and planned for improvements in atmospheric warning connectivity.
 - (U) Prepared Tethered Aerostat Radar System (TARS) Engineering Change Proposal (ECP) and Automated Air Movement Data System (AAMDS) Advanced Change Study Notice (ACSN).
 - (U) FY 1993 Planned Program:
 - (U) Activate Block A of AICU at five additional SOCCs, including the NORAD System Support Facility (NSSF).
 - (U) Achieve Initial Operational Capability (IOC) and Full Operational Capability (FOC) for AICU core program.
 - (U) Begin ECP to implement AAMDS.
 - (U) Complete study on flight plan correlation methods.
 - (U) Complete AICU testing.
 - (U) Complete installation of three remaining AICUs following delivery of ECP 5 software modification.
 - (U) Initiate Contractor Logistics Support for AICUs.
 - (U) Initiate permanent hardware/software configuration management procedures.

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Program Element: #0102325F
PE Title: Joint Surveillance System (JSS)

Budget Activity: #3 - Electronics and Tele-
communications Equipment

(U) FY 1994 Planned Program:

- (U) Achieve operational capability for AAMDS interfaces and flight plan correlation.
- (U) Develop Block B upgrades based on deferred requirement priorities.

(U) Work Performed By: Air Force program management for the JSS Region and Sector Operations Control Centers (ROCCs/SOCCs) is by Air Force Materiel Command, Wright-Patterson AFB, OH. The prime contractor for the JSS ROCCs/SOCCs is Hughes Aircraft Corporation, Fullerton, CA. Management of the JSS Connectivity is by the Electronic Systems Center, Air Force Materiel Command, Hanscom AFB, MA. Technical support is provided by MITRE Corporation, Burlington, MA. The prime contractor for the AICU is TRW, Aurora, CO.

(U) Related Activities:

- (U) Program Element #0102417F, (Over-the-Horizon Backscatter OTH-B)
- (U) Program Element #0102412F, (North Warning System NWS)
- (U) Program Element #0604725N, (Relocatable Over-the-Horizon Radar ROTH-R)
- (U) Program Element #0207417F, (Airborne Warning And Control System AWACS)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

Other Procurement - Air Force 3080, Budget Activity 3 - Electronics and Telecommunications Equipment, P-1 Line Item 144:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	10,557	18,830	7,410	Continuing	TBD

(U) International Cooperative Agreements: The JSS-C program upgrades the JSS ROCCs/SOCCs as part of the North American Defense Modernization Memorandum of Understanding signed in 1985 by the US Secretary of Defense and the Canadian Minister of Defense. This allows Canada to implement cost-effective and operationally consistent changes to their JSS ROCCs.

2. (U) Project Number: 2996. Project Title: FAA/AF Radar Replacement (FARR):

The FAA/Air Force Radar Replacement (FARR) program will replace 39 existing JSS radars with solid-state, three-dimensional ARSR-4 radars to improve mission performance and reduce operation and maintenance costs. This includes technical radar site surveys and interface engineering in preparation for system installation, test, and check-out.

(U) FY 1992 Accomplishments:

- (U) Purchased eight FARR radars.
- (U) Supported contractor system engineering for FARR JPO.
- (U) Provided engineering support for site preparations and radar production.
- (U) Continued interoperability evaluations and commissioning support.

(U) FY 1993 Planned Program:

- (U) Purchase final six of the thirty-nine FARR radars.
- (U) Accept delivery of two FARR radars.

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Program Element: #0102325F
PE Title: Joint Surveillance System (JSS)

Budget Activity: #3 - Electronics and Tele-
communications Equipment

- (U) Continue contractor system engineering support for FARR JPO.
- (U) Provide support for site preparation, radar production, installation, test and system checkout.
- (U) Continue environmental impact studies.
- (U) Continue development of site design engineering packages, interoperability evaluations and commissioning support activities.

(U) FY 1994 Planned Program:

- (U) Accept delivery of thirteen FARR radars, bringing the cumulative deliveries to date to fifteen.
- (U) Continue contractor system engineering support for FARR JPO.
- (U) Continue development of site design engineering packages.
- (U) Continue engineering support for site preparation, radar production, installation, test and system checkout.
- (U) Continue interoperability evaluations and commissioning support.

(U) Work Performed By: The Federal Aviation Administration is the lead acquisition agency for the FAA/AF Radar Replacement Program in accordance with a 19 November 1984 sub-agreement (as amended by Amendment #1, dated 1 September 1988) to FAA/AF National Agreement (NAT) 711. The FAA and the Air Force have established a Joint Program Office at HQ FAA, Washington, DC, for this procurement. Westinghouse Corporation, Baltimore, MD, is the prime contractor for the FARR program.

(U) Related Activities:

- (U) National Agreement 614 - Memorandum of Agreement (Amendment 2) between the Federal Aviation Administration and the United States Air Force for Joint Use of Air Defense Radar Assets Within the Continental United States, 1 Sep 88.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

Other Procurement - Air Force 3080, Budget Activity 3 - Electronics and Telecommunications Equipment, P-1 Line Items 105 and 141:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	53,926	40,857	103	Continuing	TBD

(U) International Cooperative Agreements: None.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102411F
 PE Title: Surveillance Radar Stations/Sites
(SRS)

Budget Activity: #3 - Electronics and Tele-
communications Equipment

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2980 North Atlantic Defense System (NADS)	10,233	6,472	8,306	Continuing	TBD
3159 Caribbean Basin Radar Network (CBRN)	<u>1,240</u>	<u>1,223</u>	<u>0*</u>	<u>Continuing</u>	<u>TBD</u>
Total	11,473	7,695	8,306	Continuing	TBD

*Future requirements funded through OSD Counterdrug Program, Project Number 4207, PE #0102446F.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds command, control and communications (C3) and air surveillance improvements in the North Atlantic and the Caribbean. The NADS program provides improvements to C3 and surveillance capabilities in Iceland. The CBRN program provides for the deployment of three-dimensional air surveillance radar systems and associated C3 capabilities in the Caribbean Basin. Beginning in FY 1994, funding support for the Caribbean Basin Radar Network will be provided in OSD Counterdrug Program, Project Number 4207, PE #0102446F.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:1. (U) Project Number: 2980. Project Title: North Atlantic Defense System:

The NADS program provides improvements to C3 and air surveillance capabilities in Iceland in support of air defense requirements in the strategically important Greenland-Iceland-Norwegian (G-I-N) gap. Control and Reporting Center (CRC) improvements and new air surveillance radars are NATO Infrastructure funded. US funds remotely keyed cryptographic capabilities and systems engineering and integration activities for the total program per US-Iceland MOU.

(U) FY 1992 Accomplishments:

- (U) Completed installation and integration of three NATO radars in Iceland.
- (U) Continued development of the NATO Iceland Air Defense System (IADS).
- (U) Issued contract modification to incorporate updated data link requirements.
- (U) Completed IADS preliminary design phase.

(U) FY 1993 Planned Program:

- (U) Continue development of IADS.
- (U) Complete IADS critical design phase.
- (U) Complete Iceland NATO Radar program.
- (U) Support development of remote crypto re-keying capability

(U) FY 1994 Planned Program:

- (U) Evaluate prototype hardware and initiate production program for remote crypto re-keying of the radar sites.

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Program Element: #0102411F
 PE Title: Surveillance Radar Stations/Sites
(SRS)

Budget Activity: #3 - Electronics and Tele-
communications Equipment

- (U) Continue development of IADS.
- (U) Start IADS in-plant Developmental Test & Evaluation (DT&E) effort.
- (U) Start IADS on-site communications interface effort.

(U) Work Performed By: NADS is managed by the Electronic Systems Center, Air Force Materiel Command, Hanscom AFB, MA. Technical support is provided by MITRE Corporation, Burlington, MA, and Rome Air Development Center, Air Force Materiel Command, Griffiss AFB, NY. General Electric Corporation, Syracuse, NY, is the contractor for the Iceland NATO Radar Subsystem. Hughes Aircraft Company, Fullerton, CA, is the contractor for the Control and Reporting Center (CRC)/ Communication subsystem.

(U) Related Activities:

- (U) Program Element #0102412F, (DEW Radar Stations)
- (U) Program Element #0102325F, (Joint Surveillance System JSS)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

Other Procurement - Air Force 3080, Budget Activity 3 - Electronics and Telecommunications Equipment, P-1 Line Items 111 and 141:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	5,038	453	312	Continuing	TBD

(U) International Cooperative Agreements: NADS is a NATO Infrastructure Program funded primarily with NATO funds. The cost sharing relationship is nominally 15/85 with US paying roughly 15% of total costs. US funds cryptographics capabilities, systems engineering, and integration activities for the total program per US-Iceland MOU.

2. (U) Project Number: 3159, Project Title: Caribbean Basin Radar Network:

The CBRN program provides for the deployment of three-dimensional air surveillance radar systems and associated C3 capabilities in the Caribbean Basin. CBRN is intended to provide improved air surveillance and C3 capabilities, promote regional cooperation, and enhance counterdrug capabilities through integration of new and existing radars into the surveillance network.

(U) FY 1992 Accomplishments:

- (U) Completed radar installation and achieved Full Operational Capability (FOC) in Trujillo, Honduras, and in Rio Hacha, Columbia.
- (U) Completed Venezuela site survey/design and exercised contract options to procure two radar systems in Venezuela.

(U) FY 1993 Planned Program:

- (U) Complete radar installation and achieve FOC in Costa Rica and in Grand Cayman Islands. (Accomplished Dec 92.)
- (U) Begin facilities construction for two Venezuela sites, achieve FOC for first site.

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Program Element: #0102411F
PE Title: Surveillance Radar Stations/Sites
(SRS)

Budget Activity: #3 - Electronics and Tele-
communications Equipment

- (U) Award contract options to procure command center upgrades for the South Region Operations Center (SROC).
 - (U) Upon release of FY93 funds, begin integration of Maracay, Venezuela, host nation radar into network.
 - (U) After signing of Host Nation Agreements, begin integration of Cerro la Mole, Honduras, and Barranquilla, Columbia, host nation radars into CBRN network.
- (U) FY 1994 Planned Program:
- (U) Not applicable. All future requirements funded through the OSD Counterdrug Program, Project Number 4207, PE #0102446F.
- (U) Work Performed By: CBRN is managed by the Electronic Systems Center, Air Force Materiel Command, Hanscom AFB, MA. Technical support is provided by MITRE Corporation, Burlington, MA, and Rome Air Development Center, Air Force Materiel Command, Griffiss AFB, NY. Westinghouse Corporation, Baltimore, MD, and Texcom, Lanham, MD, are the CBRN contractors.
- (U) Related Activities:
- (U) Program Element #0102325F, (Joint Surveillance System JSS)
 - (U) Program Element #0102446F, (OSD Counterdrug Program, Project Number 4207)
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Procurement funding for CBRN is provided in year of execution through the OSD Counterdrug Program, Project Number 4207, PE #0102446F.
- (U) International Cooperative Agreements: Host Nation Agreements (HNA's) are pursued in connection with each planned CBRN site. HNA's have been signed with Honduras, Columbia, Dominican Republic, Cayman Islands, Costa Rica and Venezuela.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102412F
 PE Title: DEW Radar Stations

Budget Activity: #3 - Electronics and Tele-
communications Equipment

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2710 North Warning System (NWS)	2,195	2,444	2,578	Continuing	TBD
Total	2,195	2,444	2,578	Continuing	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE provides air surveillance capability and tactical warning of bomber or cruise missile attack against the North American Continent through a Distant Early Warning (DEW) Line extending from Alaska to Labrador. This warning has provided the National Command Authorities with time for decision making and survival actions, permitting the launch of strategic retaliatory and command and control aircraft for survival, as well as the ability to alert air defense fighters to intercept attacking aircraft. The DEW Line, however, can be underflown by threat bombers because of numerous gaps at low altitude and marginal radar performance. Due to its age (1957 initial deployment), the DEW Line is increasingly difficult and costly to operate and maintain. The NWS program replaces the aging DEW Line and will eliminate low-altitude coverage gaps, improve radar performance, and reduce operation and maintenance costs. The continuing requirement for NWS coverage was revalidated by CINCNORAD in FY93. The NWS is a joint US/Canadian program with an FOC in late 1994.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project Number: 2710 Project Title: North Warning System (NWS): A network of deployed Minimally Attended Radars (MARs) and to-be-deployed Unattended Radars (UARs) will provide tactical warning/attack assessment for northern air attack approaches to North America.
 - (U) FY 1992 Accomplishments:
 - (U) Awarded communications equipment contract for three Alaskan sites.
 - (U) Award contract for construction of Maintenance Control and Communications Center.
 - (U) Awarded contract for Type 1 Factory Training (participation with industry) to support Canadian depot facility.
 - (U) Shipped Prime Installation equipment and Intermediate Support Equipment.
 - (U) Awarded Alaskan facilities construction contract (three sites).
 - (U) FY 1993 Planned Program:
 - (U) Continue to support deployment and site integration for Canadian and Alaskan UAR systems.
 - (U) FY 1994 Planned Program:
 - (U) Continue program support for deployment and site integration for Canadian and Alaskan UAR systems.

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Program Element: #0102412F
PE Title: DEW Radar Stations

Budget Activity: #3 - Electronics and Tele-
communications Equipment

(U) Work Performed By: This effort is managed by the Electronic Systems Center (ESC), Air Force Materiel Command, Hanscom AFB, MA. MITRE Corporation, Burlington, MA, Rome Air Development Center, Griffiss AFB, NY, Analytical Systems Engineering Corporation (ASEC), Burlington, MA, and the Electromagnetic Compatibility Analysis Center (ECAC), Annapolis, MD, are providing technical support. Paramax (formerly UNISYS), Great Neck, NY, was selected in FY91 as the production contractor for the Unattended Radar (UAR) and overall systems engineering. This contract was awarded as a follow-on to design technical competition. Canadian NWS efforts are managed by a Canadian program office located in Ottawa.

(U) Related Activities:

- (U) Program Element #0102325F, (Joint Surveillance System JSS)
- (U) Program Element #0102411F, (Surveillance Radar Stations/Sites SRS)
- (U) Program Element #0102417F, (Over-the-Horizon Backscatter OTH-B)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

Other Procurement - Air Force 3080, Budget Activity 3 - Electronics and Telecommunications Equipment, P-1 Line Items 107 and 144:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	7,590	0	3,353	0	539,500

(U) International Cooperative Agreements: The North Warning Program is the key element of North American Air Defense Modernization established by the March 1985 Memorandum of Understanding between the United States and Canada, signed by Secretary of Defense Weinberger and Canadian Minister of Defense Nielson. The NAADM MOU established a cost sharing relationship of 60/40, with Canada responsible for 40 percent of total costs.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207129F
PE Title: F-111 Squadrons

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2962 F-111 Avionics Modernization Program (AMP)	6,557	376	0	0	131,517
3079 F-111 Digital Flight Control System (DFCS)	5,476	6,895	2,285	0	66,117
1332 F-111 Crew Escape Module Parachute Replacement	6,200	400	1,961	0	10,863
1930 F-111 Stores Management System	<u>9,590</u>	<u>19,968</u>	<u>21,504</u>	<u>55,696</u>	<u>106,758</u>
Total	27,823	27,639	25,679	55,696	315,255

B. (U) BRIEF DESCRIPTION OF ELEMENT: The F-111 is the premier long range precision guided weapon delivery platform in the United States Air Force. This program provides funds to develop improved systems for the F-111 aircraft. These improvements maintain the weapon system as a safe, reliable, and maintainable aircraft. The F-111E,F and EF model aircraft are currently planned to be in service throughout their service life which is approximately 2018.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 3079, Digital Flight Control System (DFCS): The DFCS is a permanent safety modification that replaces the electronic portion of the F/EF-111 flight control system with a modern state-of-the-art digital computer and sensors. This project will also improve the critical interfaces of the flight control system by incorporating the on-board autopilot and low altitude monitor and monitoring the terrain following radar systems. As a by-product of this safety modification, the system reliability of the flight control system will be improved from the current 60 hours to 673 hours.

(U) FY 1992 Accomplishments:

- (U) Complete development of the Maintenance Training Set (MTS).
- (U) Start testing on EF-111A aircraft.
- (U) Complete kitproof on F-111E/F.

(U) FY 1993 Planned Program:

- (U) Complete testing on EF-111A aircraft.
- (U) Resolve service reports from kit proofing and EF-111A flight test
- (U) Begin development of Test Program Sets (TPS).

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Program Element: #0207129F
PE Title: F-111 Squadrons

Budget Activity: #4 - Tactical Programs

(U) FY 1994 Planned Program:

- (U) Develop and incorporate changes from flight test
- (U) Complete development of TPS.

(U) Work Performed by: The Digital Flight Control System (DFCS) contractor is General Dynamics, Ft Worth, TX. The F-111 System Manager is located at Sacramento Air Logistics Center, McClellan AFB, CA. The DFCS development effort is managed at Aeronautical Systems Division, Wright-Patterson AFB, OH.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

Aircraft Procurement Funds (BA 5 BP 11 P1 Line 29 &30):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	28,000	400	400	1,200	58,400

(U) International Cooperative Agreements: None.

2. (U) Project 1332, F-111 Crew Escape Module Parachute Replacement: A permanent safety modification to replace the current capsule parachute in the F-111 fleet. Approximately 28% of the F-111 ejections have resulted in major back injuries (spinal fractures) when their escape module impacts the ground. An even higher percentage of ejections have resulted in less severe back injuries to the crew members. A previous effort in this project was terminated because of insurmountable technical problems during high speed ejections. Since this previous effort was terminated, there have been three ejections in the F-111, all of which resulted in air crew back injuries when the module impacted the ground. The current proposed effort uses a different approach and newer technology to slow down the capsule descent rate and prevent future injuries. Initial parachute deployment problems will be overcome by using a drogue gun to forcefully initiate pilot parachute canopy deployment. The extra development has required a program slip and additional funding.

(U) FY 1992 Accomplishments:

- (U) Identified slow parachute deployment times
- (U) Revised development plan to incorporate drogue gun

(U) FY 1993 Planned Program:

- (U) Initiate expanded development phase
- (U) Incorporate drogue gun

(U) FY 1994 Planned Program:

- (U) Complete development phase
- (U) Initiate qualification testing

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Program Element: #0207129F
PE Title: F-111 Squadrons

Budget Activity: #4 - Tactical Programs

(U) Work Performed By: The Escape Module Modification parachute contractor is Irvin Industries, Inc., Santa Ana, CA. The development effort is managed by the F-111 System Manager located at Sacramento Air Logistics Center, McClellan AFB, CA.

(U) RELATED ACTIVITIES: The parachute program requires the installation of an impact attenuation bag which will be installed concurrently with the parachute. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

Aircraft Procurement Funds (BA 5 BP 11 P1 Line 29 & 30):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	0	0	1,200	5,800	7,700

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207129F
PE Title: F-111 Squadrons

Project Number: 1930
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
F-111 Stores Management System (SMS)	9,590	19,968	21,504	55,696	106,758

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The existing SMS is failure prone and rapidly becoming unsupportable. This project will design, fabricate, and test a solid state weapon system controller and cockpit control panel and replace the release programming unit, central programming unit, and cockpit control panel in the F-111E/F. This modification will provide much needed reliability and maintainability improvements and provide a common SMS throughout the F-111 fleet. This modification also implements MIL-STD-1760, which will allow the F-111 to deliver the next generation of precision weapons. This program will increase the F-111 war fighting capability by eliminating inadvertent releases and release failures, and reduce operations and support costs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:
 - (U) Start full scale development.
 - (U) Start operational flight program support equipment development
2. (U) FY 1993 Planned Program:
 - (U) Continue full scale development
 - (U) Preliminary software and hardware design.
 - (U) Preliminary Design Review.
 - (U) Software development for operational flight program support equipment
3. (U) FY 1994 Planned Program:
 - (U) Critical Design Review.
 - (U) Fabricate and install prototype.
4. (U) Program to Completion:
 - (U) Start flight test.
 - (U) Hardware functional and physical configuration audit.
 - (U) Start kitproof.
 - (U) Complete kitproof.
 - (U) Production installation.

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Program Element: #0207129F
PE Title: F-111 Squadrons

Project: 1930
Budget Activity: #4 - Tactical Programs

- D. (U) Work Performed By: Sacramento Air Logistics Center is accomplishing the development and production phases of this modification organically. Computing Devices International of Minneapolis, Minnesota, is a subcontractor aiding development of circuit cards components.

- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: RDT&E schedule changes are due to a two year slip in procurement funding.
3. (U) COST CHANGES: Sacramento Air Logistics Center's decision to perform this modification in-house, plus the stated schedule change, resulted in the observed funding requirements. Current funding includes refined cost estimates by Sacramento Air Logistics Center.

- F. (U) PROGRAM DOCUMENTATION:

- (U) Tactical Air Command Configuration Control Board Approval, 11 May 90

- G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

- H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Aircraft Procurement (3010) Funds (BA 5 BP 11 P1 Line 29 & 30):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	0	0	0	54,500	54,500

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

- J. (U) MILESTONE SCHEDULE:

1. (U) Program Start Jun 92
2. (U) Preliminary Design Review May 93
3. (U) Critical Design Review Oct 93
4. (U) Flight test Mar - Oct 95
5. (U) Kitproof Apr - Oct 95
6. (U) Production install Nov 97 - Mar 02

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207133F

Project: # 2671

PE Title: F-16 Squadrons

Budget Activity: #4-Tactical Programs

Project Title: F-16 Squadrons

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POPULAR NAME: F-16 Falcon

A.. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousand)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	N/A	N/A	N/A	N/A
Engineering Milestones	MLU SDR, Blk 50D CDR	MLU PDR, Blk 50D FCA/PCA, Recce SPR/APR	MLU CDR, Blk 40 CAS SPR/SRP, Recce PDR/CDR	Blk 50 P/U FLA Blk 40 CAS P/CDR/FLA MLU/Recce IOTE
T&E Milestones	Blk 50D Integration	Blk 50D Integration	On-going DT&E	On-going DT&E
Contract Milestones	Continue MLU Initiate MMC	Continue MLU Initiate CAS	Continue MLU & CAS	Initiate Follow-on MRF
BUDGET				Program Total
(\$000)	FY 1992	FY 1993	FY 1994	(To Complete)
Major Contract	134,200	96,901	104,421	2,123,900 (810,700)
Support Contract	600	0	0	232,600 (0)
In-House Support	8,900	8,800	9,000	213,100 (48,200)
GFE/Other	4,261	3,708	3,526	105,262 (19,967)
Total	147,661	109,409	116,947	2,674,862 (878,867)

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Program Element: # 0207133F
PE Title: F-16 Squadrons

Project Number: # 2671
Budget Activity: #4-Tactical Programs
Date: February 1, 1993

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

There is a continuing need for modernization of the USAF and allied multimission tactical fighter forces. The F-16C/D is intended to fulfill these requirements. The F-16 is a single-engine, single-seat, multirole tactical fighter with full air-to-air and air-to-surface combat capabilities. It is employed in a complementary role to the F-15 in counter-air missions and as a primary aircraft in the surface attack role. It replaced most F-4s and modernizes the Air Reserve Forces. This project includes tasks to develop, integrate, and qualify systems to enhance the overall performance of the F-16 in the accomplishment of its mission. These improvements are grouped into a comprehensive, cost-effective Multinational Staged Improvement Program (MSIP). They include expanded air combat identification capability, updated electronic warfare suite, and incorporation of improved communication/ identification equipment. In addition, this project develops enhanced night, under-the-weather attack capability in the air-to-ground role. Improvements include a higher maximum takeoff weight, improved air-to-air gun sight algorithms, digital flight controls, and improved pilot interface. Combat capability and versatility will be increased by integration of an Increased Performance Engine (IPE), and enhanced with the addition of advanced air-to-surface and air-to-air missiles and munitions. It develops air-to-ground capabilities for Close Air Support (CAS) including an improved laser spot tracker-equipped LANTIRN pod, a VHF anti-jam radio and an Improved Data Modem (IDM) for retrofit into Block 40 F-16C/D aircraft. The project also develops CAS enhancements for Block 30 C/D including Pave Penny, IDM, VHF anti-jam radio, and 30MM Gun Pod. To continue to meet the need beyond the turn of the century, a Mid-Life Update (MLU) of aircraft avionics will be conducted in concert with our European partners. MLU involves various mods to European F-16 A/B and USAF Block 50 aircraft. In response to a continued requirement for a real time tactical reconnaissance capability to replace the aging RF-4, the USAF will conduct a retrofit modification of F-16C/D aircraft to perform a reconnaissance role using the Advanced Tactical Air Reconnaissance System (ATARS), sensor suite and associated software avionics upgrades. The latest version of the F-16C/D (Block-50D first delivery late FY93) will have a significantly improved displays processor enabling the display of more situational awareness information to the pilot. It will also have data link capability and fully integrate the targeting capability of the latest Block IV version of the HARM, enabling the F-16 Block 50Ds to augment F-4G Wild Weasles in the Suppression of Enemy Air Defense (SEAD) role.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Definitized MLU program EMD contract.
- (U) Initiated MLU retrofit program planning.
- (U) Initiated MMMC upgrade for Block 50.

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Program Element: # 0207133F
PE Title: F-16 Squadrons

Project Number: # 2671
Budget Activity: #4-Tactical Programs
Date: February 1, 1993

2. (U) FY 1993 Planned Program:

- (U) Continue MLU EMD.
- (U) Award MLU kit production contract.
- (U) Continue MMMC upgrade for Block 50.
- (U) Define CAS Block 40 requirements.

3. (U) FY 1994 Planned Program:

- (U) Install MLU kits in trial verification installation aircraft
- (U) Continue MMMC computer upgrade.
- (U) Initiate Block 40 CAS EMD.
- (U) Initiate Follow-on Multirole Fighter (MRF) studies.

4. (U) Program to Completion:

- (U) Conduct MLU contractor flight testing.
- (U) Continue retrofit MMMC computer upgrade into Block 50.
- (U) Continue Block 40 CAS EMD.
- (U) Continue Follow-on Multirole Fighter (MRF) studies.
- (U) Begin MLU kit deliveries to EPG in FY1997.
- (U) MLU aircraft retrofit FY1997 to FY2002.
- (U) Complete MMMC computer upgrade.
- (U) Initiate follow-on MRF EMD

D. (U) Work Performed By: The F-16 System Program Office of the Aeronautical System Center (ASC), Wright Patterson Air Force Base, OH, has implemented a single manager organization as a selected program under the Integrated Weapon System Management (IWSM) program initiative. The F-16 Program Office has management responsibility for the total F-16 program including the F-16 A/B program which had previously transferred to Ogden Air Logistics Center (Air Force Logistics Command) Hill Air Force Base, UT. The F-16 System Support Director at Ogden Air Logistics Center is directly responsible to the F-16 Systems Program Director for overall system sustainment. The major contractors are Lockheed, Fort Worth, TX (airframe); Pratt & Whitney, E st Hartford, CT, and General Electric, Evendale, OH (engines), and Westinghouse, Baltimore, MD (radar). Major manufacturers include Fabrique Nationale, Belgium (engine); SABCA/SONACA, Belgium (aft fuselage, wings, and assembly); FOKKER, The Netherlands (center fuselage and assembly); TAI, Turkish Aerospace Industries, (mate through assembly); DAF, the Netherlands (landing gear); Per Udsen, Denmark (pylons and vertical fin); Kongsberg Vapenfabrikk, Norway (internal navigation set and fan drive module); and General Electric Corporation, England (GEC) (heads-up display).

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

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Program Element: # 0207133F
PE Title: F-16 Squadrons

Project Number: # 2671
Budget Activity: #4-Tactical Programs
Date: February 1, 1993

1. (U) TECHNICAL CHANGES: Plan for alternative CAS upgrades to Block 40 and Block 30 vice a Block 30 CAS/BAI upgrade.
2. (U) SCHEDULE CHANGES: Software FCA/PCA slipped from March 1997 to January 1998 for MMC. CAS development on hold pending USAF and OSD resolution of which program to fund.
3. (U) COST CHANGES: \$91.4M reduction in FY94 (\$41.9M from core avionics computer, \$31.3M from follow-on MRF EMD slip to FY96, \$19.2M for transfer to LANTIRN P.E. 64249F for Block 40 CAS laser spot tracker offset by an increase of \$1.0M for several smaller efforts).

F. (U) PROGRAM DOCUMENTATION:

- (U) DCP #120, LWF Prototype, 1 Nov 72.
- (U) TAC ROC 303-76, F-16 Air Combat Fighter, 27 Feb 76.
- (U) DCP 3 143, Multipurpose Fighter (F-16) 8 May 78.
- (U) TAF SON 28 Dec 78.
- (U) F-16C/D TEMP, 22 Mar 91.
- (U) TAF 303-76: F-16 SORD for the F-16 Block 50, 5 Aug 91
F-16 SORD for the F-16 Block 40, 16 Jul 91
- (U) TAF 302-87-1/11-A: SORD for Follow-on Manned Reconnaissance System, 21 Mar 90
- (U) Milestone IV ADM, CAS, 28 Nov 90
- (U) TAF 310-85, ADF, 5 Aug 87

G. (U) RELATED ACTIVITIES:

- (U) PE #0604249F, Night/Precision Attack.
- (U) PE #0207217F, ATARS (F-16R)
- (U) PE #0603742F, Combat Identification Technology.
- (U) PE #0604218F, Engine Model Derivative Program.
- (U) PE #0604268F, Aircraft Engine Component Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Procurement (BP10 & BP16 Includes initial spares):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	1,220,700	704,183	796,651	1,746,146	37,140,900
Quantity	48	24	24	24	2,237

(U) Military Construction: FY93 = 19,250.

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The MLU kit will be a major avionics upgrade to the current EPG F-16A/B inventory. The basic kit will include a core computer upgrade, Digital Terrain System, APG-66 (V2A) radar upgrade, Improved Data Modem, Global Positioning System and Group A provisions for Night Vision and Microwave Landing Systems. In addition, several countries will also receive an Advanced

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Program Element: # 0207133F
PE Title: F-16 Squadrons

Project Number: # 2671
Budget Activity: #4-Tactical Programs
Date: February 1, 1993

Identification Friend or Foe and/or a Helmet Mounted Display. USAF RDT&E funding (\$104M) for EMD has been budgeted to cover the 5-year EMD period. The production phase of the program is scheduled to begin in early 1993, with kit deliveries to commence in 1996 and continue through early 1999 for the USAF portion. Kit deliveries for the EPG begin in 1996 and continue through 2000.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
F-16A/B Improvements	Dec 76 to present	Extensive testing on ADF: improved A/A radar, ADF AIM 120 capability, AIM-7 capability, ADF/AMRAAM separations testing completed Jul 92, SEEK EAGLE & FMS OFF tests.
F-16C/D DT&E	Nov 82 to present	Airframe, and avionics testing related to Blk 30, 40, 50 improvements. Blk 50 P2 started Jan 92, Blk 40 Tape 4 started 1 Apr 92, Blk 40 SEEK EAGLE test on-going.
F-16C/D FOT&E	Jun 85 to present	Blk 40 IOT&E completed 30 Oct 89. Continued Blk 30 software update 1 & Blk 40 tape 3 testing.

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
F-16A/B Improvements	Jan 92 to Dec 97	Continue tests on software updates for OFF & RADAR, SEEK EAGLE, Mid Life Update
F-16C/D (MSIP)	Jul 92 to Dec 95	Continued airframe and avionics testing related to Blk 30, 40, and 50 aircraft: stability and control, IPE, SEEK EAGLE, avionics, ECM, and ECCM.

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Program Element: # 0207133F
PE Title: F-16 Squadrons

Project Number: # 2671
Budget Activity: #4-Tactical Programs
Date: February 1, 1993

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
F-16C/D IOT&E	Currently Inactive	Each major subsystem testing will depend on its development schedule.
F-16C/D FOT&E (AMRAAM, ALR-56M, ALE-47, LANTIRN, GPS & RLG)	Continuing	Continue Air Combat Command testing of Blk 40/42/50/52 subsystems

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207134F
 PE Title: F-15E Squadrons

Budget Activity: #4 - Tactical Programs

Project Title: F-15 Squadrons

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POPULAR NAME: F-15 EAGLE

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993 *	FY 1994	To Complete
Program Milestones	N/A	N/A	N/A	N/A
Engineering Milestones	Ongoing Integration	Ongoing Integration	Ongoing Integration	Ongoing Integration
T&E Milestones	Follow-on Weap Integ Ftt Test	Ongoing Upgrades	Ongoing Upgrades	Ongoing Upgrades
Contract Milestones	1st VHSIC Equipped A/C Del	LANTIRN Integ Complete	Release Integ OFP	GPS Integ DMS Integ
BUDGET				TOTAL PROGRAM
(\$000)	FY 1992	FY 1993	FY 1994	(To Complete)
Major Contract	57,788	22,596	75,097	Continuing
Support Contract	4,400	5,800	200	Continuing
In-House Support	30,800	21,100	16,200	Continuing
GFE/ Other	0	10,453	0	Continuing
Total	92,988	59,949	91,497	Continuing

* FY 1993 INCLUDES \$10,453M FROM PE 0207130F

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Program Element: # 0207134E
PE Title: F-15E Squadron

Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The F-15E is the most versatile fighter in the world today. With conformal fuel tanks, the F-15E can deploy worldwide with minimal tanker support and arrive in a combat-ready configuration. The F-15E retains the basic air-to-air capability and adds systems, such as Low Altitude Navigation Targeting Infrared for Night (LANTIRN), to meet the requirement for all-weather, deep penetration, and night & under-the-weather, air-to-surface attack. However, the emerging threat includes a new generation of aircraft possessing all-weather detection and kill capabilities. To maintain the F-15E's superiority against the threat through the 1990s, avionics, armament, airframe, and engine improvements are required. Avionics changes exploiting proven technology advances are being incorporated into the F-15E providing expanded capability and support an updated and fully integrated electronic warfare suite. Further, this project develops enhanced capability for the air-to-ground role. In addition, overall combat capability is increased by integration of an Increased Performance Engine (IPE), and a Very High Speed Integrated Circuit (VHSIC) Central Computer (CC) into the aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continue development and testing of the improvements initiated in FY 1991 and prior.
- (U) Continued flight test and RDT&E tasks associated with SEEK EAGLE, Tactical Electronic Warfare System (TEWS) integration, VHSIC CC development, Radio Frequency (RF) compatibility, advanced algorithm Electronic Counter-Counter Measures (ECCM), Ground Collision Warning System (GCWS), and LANTIRN integration.
- (U) Initiated development of the Down-Sized Tester to replace the obsolete and unsupportable F-15A-E avionics intermediate test stations, integration of Global Positioning System (GPS), development & integration of Digital Mapping System (DMS), and software development & integration for the Air Force Mission Support System (AFMSS).
- (U) Completed vertical tail redesign study and probe/drogue study.
- (U) Implemented Integrated Weapon Systems Management Approach for the F-15A-E which will result in a "cradle to grave" single program director for the weapon system.
- (U) Initiated testing of RF compatibility design.

2. (U) FY 1993 Planned Program:

- (U) Continue development and testing of the improvements initiated in FY 1992 and prior.
- (U) Complete VHSIC CC development, RF compatibility design, MSS integration, and LANTIRN integration.
- (U) Continue flight test and RDT&E tasks associated with SEEK EAGLE, TEWS integration, advanced algorithm ECCM, combat ID improvements, GCWS, Standard Flight Data Recorder (SFDR), and GPS, DMS, Down Sized Tester and AFMSS integration.
- (U) Initiate implementation of post-production support activities for the F-15A-E.
- (U) Initiate spin/departure prevention program.

3. (U) FY 1994 Planned Program:

- (U) Continue development and testing of the improvements initiated in FY 1993 and prior.
- (U) Continue flight testing and RDT&E tasks associated with SEEK EAGLE, TEWS integration, RF Compatibility, advanced algorithm ECCM, LANTIRN enhancements, SFDR, GPS, AFMSS, APG-63 radar upgrade, DMS, AFMSS.
- (U) Continue development of Air Force organic support facilities and initiatives.
- (U) Release the first fully integrated Operational Flight Program (OFP) to include TEWS, AFMSS, GCWS, and LANTIRN enhancements.
- (U) Initiate development of an APG-63 radar supportability upgrade.
- (U) Initiate integration of JDAM into the F-15E

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Program Element: # 0207134F
PE Title: F-15E Squadron

Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion:

- (U) Complete SEEK EAGLE, TEWS integration, advanced algorithm ECCM and combat Identification (ID) improvements, GPS integration, DMS integration, Down Sized Tester, APG-63 radar upgrade, AFMSS integration, and JDAM integration.

D. (U) Work Performed By: The F-15E development is being managed by the F-15 System Program Office, Aeronautical Systems Division, Wright-Patterson Air Force Base OH. McDonnell-Douglas Corporation, St. Louis MO, is the prime contractor for development and production of the F-15 aircraft. Pratt & Whitney division of the United Technology Corporation, West Palm Beach FL, is the engine contractor. Hughes Aircraft Company, Culver City CA, is the radar subcontractor to McDonnell-Douglas Corporation. Northrop Corporation, Rolling Meadows IL, is responsible for the ALQ-135 Internal Countermeasures System. Loral Corporation, Yonkers NY, is responsible for the ALR-56C Radar Warning Receiver. The major in-house developing organizations are Air Force Flight Test Center, Edwards AFB CA, Air Force Development Test Center, Eglin AFB FL, and Arnold Engineering Development Center, Tullahoma TN.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: SAC rescinded probe/droque in FY92. AF cancelled probe/droque in FY94 budget.
3. (U) COST CHANGES: SAC rescinded probe/droque FY92 funds (\$19.0M). AF cancelled probe/droque in FY94 budget -- decreased \$5.9M in FY94

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF ROC 9-68, Feb 68.
- (U) DCP #19, Rev C, May 77 as amended Feb 80.
- (U) TAF SON 321-82, Jan 84.
- (U) F-15E SORD, Jul 91; F-15E TEMP, Mar 90.

G. (U) RELATED ACTIVITIES:

- (U) TEWS for F-15 application developed in PE 0604270F.
- (U) LANTIRN developed for the F-15E under PE 0604249F
- (U) Manned Destructive SEAD for F-15 developed in PE 0207136F
- (U) Joint Direct Attack Munition (JDAM) integration in PE 0604618F
- (U) There is no unnecessary duplication of effort within the Air Force or the Dept of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Procurement

FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Aircraft Procurement (BA 01) P-1 Line Item				
694,600	11,400	28,700	Continuing	TBD
Aircraft Modification (BSA 0502,WAC F01500)				
87,200	66,000	36,200	Continuing	TBD

- (U) Military Construction: Not Applicable.

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Program Element: # 0207134F
PE Title: F-15E Squadron

Budget Activity: #4 - Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None for F-15E.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
F-15E Phase IV DT&E	Sep 89	Completed
F-15E Phase V OT&E	Sep 89	Completed
F-15E Phase VII DT&E (Start)	Oct 89	Ongoing
F-15E Phase II DT&E	Dec 89	Completed
F-15E Phase VI FOT&E	Dec 92	Completed
F-15E IPE Flight Test	May 90	Completed
F-15E TEWS Early Operational Assessment	Nov 90	Completed
First APG-70/AMRAAM Launch	Nov 90	Direct Hit
F-15E SRAM-T Early Vibration Flight Test	Mar 91	Completed
ALR-56C/ALQ-135 Band 3 Integration	Jan 91	Ongoing
MSOGS DT&E	Aug 91	Completed
VHSIC DT&E	Feb 93	Completed
First APG-70 Dual AMRAAM Launches	Sep 91	Two direct Hits
F-15E TEWS Baseline Development Test	Sep 91	Started
F-15E HARM Early Vibration Flight Test	Nov 92	Completed
F-15E GCWS (Start)	Nov 92	Ongoing

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
F-15E TEWS Baseline OT&E (Start)	2Q FY93	AWC, China Lake
MSIP VHSIC OT&E	3Q FY92	AWC, China Lake
SFDR DT&E	1Q FY94	6510 TW, Edwards AFB
GPS DT&E	3Q FY94	6510 TW, Edwards AFB
Spin Departure Prevention DT&E	4Q FY94	6510 TW, Edwards AFB

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FY 1994 RDT&E SUMMARY SHEET

Program Element: #0207136E
 PE Title: Manned Destructive Suppression
 of Enemy Air Defenses

Project : #3777
 Budget Activity: #4 - Tactical Programs

Project Title : Manned Destructive Suppression of Enemy Air Defenses

POPULAR NAME : MDSEAD

A. (U) SCHEDULE/BUDGET INFORMATION (\$ In Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	MS I - Mar 92	HARM Integration MS II Jul 93		Integration MS III TBD
Engineering Milestones				Integration FCA/PCA TBD
T&E Milestones	Began HARM Vibration Flight Testing Jul 92	Completed HARM Vibration Flight Testing Nov 92		Integration DT&E/OT&E TBD
Contract Milestones	Risk Reduction Contract Award Apr 92			Integration LRIP/Production. TBD
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	To Complete
Major Contract	4,958	8,062	20,396	TBD
Support Contract		300 (COEA)	100 (COEA)	
In-House Support				
GFE/ Other				
Total	4,958	8,362	20,496	TBD

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Program Element: #0207136F
PE Title: Manned Destructive Suppression
of Enemy Air Defenses

Project : #3777
Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program provides funds for the development and procurement of the Air Force's Manned Destructive SEAD capability. The AGM-88 High-Speed Anti-Radiation Missile (HARM) is the primary munition for SEAD. The project provides the F-15 aircraft the capability to carry and employ the HARM. The F-15 will be modified with a Radio Frequency (RF) HARM Targeting Device (HTD) to allow real-time HARM employment. This overall capability is necessary due to the phase out of the F-4G Wild Weasel assets.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Updated system concept, acquisition strategy, and other program documents.
- (U) Began Demonstration and Validation phase and initiated system risk reduction for HARM integration.
- (U) Began vibration flight testing for F-15/HARM.

2. (U) FY 1993 Planned Program:

- (U) Complete vibration flight testing for F-15/HARM.
- (U) Begin EMD for F-15 HARM integration.
- (U) Analyze alternatives for HTD and select candidate system(s).

3. (U) FY 1994 Planned Program:

- (U) Continue F-15 HARM integration EMD.
- (U) Conduct integration testing and cockpit display evaluations.
- (U) Begin HTD development efforts.

4. (U) Program to Completion:

- (U) Complete HARM Integration design verification testing.
- (U) Complete HARM Integration Developmental Test and Evaluation (DT&E).
- (U) Begin low rate initial production on HARM Integration.
- (U) Conduct HARM Integration OT&E

D (U) Work Performed By: Air Force Materiel Command, Aeronautical Systems Center, F-15 Program Office, Wright-Patterson AFB, OH, is responsible for development. McDonnell Douglas Aerospace, St. Louis, MO, is the primary contractor for the F-15 HARM carriage and HARM targeting device efforts. Texas Instruments, Lewisville, TX, produces the AGM-88 HARM. Vendor selection for the subcomponents is currently in progress.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Air Force leadership has determined the need to switch the MDS mission from the F-15E to the F-15C. The HTD portion of the MDS program is under review pending analysis of candidate systems for the F-15C.
2. (U) SCHEDULE CHANGES: HARM Integration Dem/Val efforts will continue into FY94 due to the change in platform. Much of the work already accomplished on the F-15E is transferable to the F-15C. This commonality will minimize the impact of program changes on the HARM Integration phase. HTD development efforts will now begin in FY94.

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Program Element: #0207136F
PE Title: Manned Destructive Suppression
of Enemy Air Defenses

Project : #3777
Budget Activity: #4 - Tactical Programs

3. (U) COST CHANGES: During the period from October 1991 to March 1992, the F-15 System Program Office (SPO) refined the MDS program cost estimates. The refinement of the estimates was due to the evolution of more mature product definition.
- F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 312-90, AGM-88 High Speed Anti-Radiation Missile (HARM) Targeting Capability, dated 30 Aug 91.
 - (U) TAF-ORD 312-90-I-A, AGM-88 High Speed Anti-Radiation Missile (HARM) Targeting Capability, dated 10 Mar 92.
- G. (U) RELATED ACTIVITIES:
- (U) PE 0207126F (High-Speed Anti-Radiation Missile)
 - (U) PE 0207134F (F-15 Squadrons)
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- H. (U) OTHER APPROPRIATION FUNDS: None
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.
- J. (U) TEST AND EVALUATION DATA:
- | | |
|--|--------|
| - (U) Completed Vibration Flight Testing | Nov 92 |
| - (U) HARM Integration DT&E | TBD |
| - (U) HARM Integration OT&E | TBD |
| - (U) HTD DT&E | TBD |
| - (U) HTD OT&E | TBD |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207141F
 PE Title: F-117A Squadrons

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3956 F-117A	<u>64,182</u>	<u>1,224</u>	<u>6,778</u>	<u>38,548</u>	<u>110,732</u>
Total	64,182	1,224	6,778	38,548	110,732

- B. (U) BRIEF DESCRIPTION OF ELEMENT: The F-117A is the world's only operational low-observable combat aircraft. Its combination of stealth and precision weapons delivery capability allows the United States Air Force to hold even the most highly defended targets at risk. This program provides funds to develop improved systems for the F-117A aircraft. These improvements will enhance combat capability while maintaining a safe, reliable, and supportable aircraft. The F-117A is currently planned to be in service at least through the year 2015.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3956, F-117A: This project currently provides research and development for three modifications for the F-117A weapons system. The first modification enables a transition from the current Mission Planning Data System (MDPS) to the new Air Force Mission Support System (AFMSS), which will become the USAF standard planning system. This project will also include development of a common low observable auto-router for AFMSS. Second is the development of new panels and supports to replace areas of the aircraft skin that have been analytically determined to have a service life less than that of the basic aircraft. Third is the development of a new fuel tank inerting system which will conform to environmental standards. The current aircraft inerting system uses halon, an ozone layer depleting chemical which is being withdrawn from service.

(U) FY 1992 Accomplishments:

- (U) Issued Aircraft/Weapons/Electronics (A/W/E) Phase I contract for AFMSS
- (U) Identified test requirements to characterize aircraft skin loading environment and instrumented test aircraft
- (U) Survey of available fuel tank inerting concepts

(U) FY 1993 Planned Program:

- (U) Complete Phase I contract; perform source selection for A/W/E Phase II contract
- (U) Complete environment survey tests, reduce test data, and validate skin life limits
- (U) Demonstrate hollow membrane fuel tank inerting concept on F-117A

(U) FY 1994 Planned Program:

- (U) Monitor AFMSS Phase II contract throughout period of performance
- (U) Redesign life limited skin panels and prototype improved designs
- (U) Develop F-117A fuel tank inerting system and perform DT&E activities

(U) Work Performed By: Prime contractor is Lockheed Advanced Development Company, Burbank, CA. Some development work will be performed by Wright Labs, Aeronautical Systems Center, Wright-Patterson AFB, OH. The F-117A System Program Director is located at Sacramento Air Logistics Center, McClellan AFB, CA. The F-117A Development System Program Office is located at Wright-Patterson Air Force Base, OH.

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Program Element: #0207141F
PE Title: F-117A Squadrons

Budget Activity: #4 - Tactical Programs

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Aircraft Procurement (Appn 3010):					
Cost	231,337	143,982	132,074	continuing	TBD
Other Procurement (Appn 3080):					
Cost	680	542	574	continuing	TBD
Operations and Maintenance (Appn 3400):					
Cost	184,900	188,717	179,556	continuing	TBD

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207161F Budget Activity: #4 - Tactical Programs
 PE Title: Tactical Air Intercept
Missile (AIM)

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
4132 AIM-9 Product Improvement	* 0	* 0	33,887	216,313	281,800

* Funds provided to Navy in FY 92 and 93 through OSD Program Element #0603715D

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The AIM-9 short range missile (SRM) allows the destruction of enemy aircraft while denying electronic warning to their radar warning receivers. The missile is an accurate launch-and-leave weapon, and will provide for self defense in a countermeasures environment. The AIM-9X addresses the requirement for evolutionary improvements to the AIM-9

Evolutionary improvements in missile seeker, fuze/warhead, and kinematics allow retrofit of components to current missiles to the maximum extent possible. This will extend the operational effectiveness of existing inventories at an affordable cost while continuing the evolution of the AIM-9 series. Concluding in FY 93 is the AIM-9M-8/9 R&D program which provides a near-term, low cost modification to USN and USAF inventory AIM-9M missiles. It addresses

This missile modification is required

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS1. (U) FY 1992 Accomplishments:

- (U) Developed draft Joint Operational Requirements Document (JORD) and initiated Cost and Operational Effectiveness Analysis (COEA) for AIM-9X
- (U) Finalized the JORD, Test and Evaluation Master Plan, and Acquisition Plan for the AIM-9M-8/9 modification
- (U) Performed design engineering and verification testing for production of new AIM-9M-8/9 circuit boards
- (U) Conducted an independent physical configuration audit on the AIM-9M-8/9 design at the circuit board and the system level

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Program Element: #0207161F
PE Title: Tactical Air Intercept
Missile (AIM)

Budget Activity: #4 - Tactical Programs

- (U) Began Initial Operational Test and Evaluation (IOT&E) of the AIM-9M-8/9
- 2. (U) FY 1993 Planned Program:
 - (U) Complete IOT&E of AIM-9M-8/9 modification and award contract for kit production and installation
 - (U) Initiate pipeline for AIM-9M-8/9 retrofit program
 - (U) Finalize AIM-9X Joint Operational Requirements Document (JORD) and complete concept definition to include a Cost and Operational Effectiveness Analysis (COEA), systems engineering studies, and operational analyses to define optimum systems characteristics
 - (U) Prepare to initiate AIM-9X demonstration
- 3. (U) FY 1994 Planned Program:
 - (U) Award competitive AIM-9X demonstration contracts to at least two qualified vendors and proceed with demonstration
- 4. (U) Program to Completion:
 - (U) Complete engineering manufacturing development of AIM-9X evolutionary improvements for seeker, airframe kinematics, and warhead/fuze. Improvements are planned to be compatible with both forward fit and retrofit to the AIM-9 inventory.
- D. (U) Work Performed By: The Short Range Missile Joint Program Office (PMA-259), NAVAIR, manages all AIM-9 development activities under the provisions of the US Air Force/US Navy memorandum of agreement, which established the Navy as lead Service. Concept definition studies are being conducted in-house by the Naval Weapons Center, China Lake, with Air Force participation. AIM-9X seeker Dem/Val will be accomplished by defense contractors under management of the Joint Office. Funding for the AIM-9X RDT&E effort is shared 50-50 with the Navy.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

- 1. (U) TECHNICAL CHANGES: None.
- 2. (U) SCHEDULE CHANGES: The AIM-9M-8/9 program slipped approximately six months due to an increase in operational test plan requirements (from 10 to 16 missile firings), and to correct deficiencies identified during operational test. The AIM-9X program slipped approximately six months. Congress withheld FY 1992 RDT&E funds, appropriated for AIM-9X, pending a Secretary of Defense certification to Congress that RDT&E and procurement are fully funded in each service FY 1993 budget request and the fiscal years 1993-98 FYDP. These funds were not released for obligation until Jun 1992.

Program Element: #0207161F

Budget Activity: #4 - Tactical Programs

PE Title: Tactical Air Intercept
Missile (AIM)

AIM-9X seeker demonstration was extended from 24 months to 36 months due to incorporation of risk reduction efforts.

3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Memorandum of Agreement for Short Range Air-to-Air Missile Programs (U), dated 9 Oct 90.
- (U) Joint Operational Requirements Document (JORD) for an AIM-9M Short Range Missile Update (S), dated 22 Oct 91
- (U) Draft JORD for AIM-9X (S), dated 11 Jan 93

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0604354N, AAM Systems Engineering (Navy RDT&E)
- (U) Program Element #0603715D, AIM-9 Consolidated Program (OSD Account)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense. The Joint Tactical Air-to-Air Missile Oversight Committee and Steering Group provide executive level monitoring of SRM activities
- (U) Joint Potential Designator: Joint

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands):

(U) Procurement: (Missile Procurement, BA 4, P-1 Line Item 22)

	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
AIM-9M-8/9 (Mod kits)	871	11,681 (605)	4,716 (283)	57,721 (5412)	74,989 (6300)

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE

1. (U) AIM-9X Concept Definition Studies Initiated April 1991
2. (U) AIM-9M-8/9 Design Verification/Testing Started July 1991
3. (U) AIM-9M-8/9 Modification Approval 3rd Qtr FY 1993
4. (U) AIM-9M-8/9 Contract Award 3rd Qtr FY 1993
5. (U) AIM-9X Milestone IV/I 2nd Qtr FY 1994
6. (U) AIM-9M-8/9 Deliveries Start 3rd Qtr FY 1994
7. (U) AIM-9X Milestone II (EMD) 3rd Qtr FY 1997
8. (U) AIM-9X Low-Rate Initial Production (LRIP) 2nd Qtr FY 2001
9. (U) AIM-9X Full-Rate Production Approval 4th Qtr FY 2002
10. (U) AIM-9X Initial Operational Capability (IOC) 3rd Qtr FY 2003
11. (U) AIM-9X Production Deliveries Circa 2004

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207163F

Project Number: 3777

PE Title: Advanced Medium Range
Air-to-Air Missile (AMRAAM)

Budget Activity: #4 - Tactical Programs

Project Title: AMRAAM Pre-Planned Product Improvement (P3I)

POPULAR NAME: AMRAAM P3I

A. (U) SCHEDULE/BUDGET INFORMATION (\$ In Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones				
Engineering Milestones	P3I-1 PDR 12/9	P3I-1 CDR 1/93	P3I-1 FCA/PRR 3/94	
T&E Milestones			P3I-1 FLT TEST BEGIN 2/94	COMPLETE P3I-1 FLT TEST 1/95
Contract Milestones			P3I-2 2/O AWARD	
Budget (\$ 000)				Program Total
	FY 1992	FY 1993	FY 1994	(To Complete)
Major Contract	24,720	28,097	61,900	CONTINUING
Support Contract	540	1,300	1,630	CONTINUING
In-House Support	5,049	4,293	8,737	CONTINUING
GFE/Other		150	770	CONTINUING
Total	30,309	33,273	69,785	CONTINUING

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Program Element: #0207163F

Project Number: 3777

PE Title: Advanced Medium Range
Air-to-Air Missile (AMRAAM)

Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Air Force and Navy developed the baseline AMRAAM as a high performance, all weather, missile to counter existing air vehicle threats operating at high or low altitude and having advanced electronic countermeasures capabilities. The AMRAAM P3I program provides for a continuing, Joint Air Force/Navy research and development program which enables AMRAAM to be compatible with advanced fighters, enhances the missile's capability and operational flexibility against mid-1990's and beyond threats, incorporates high payoff technology developments, and investigates new variants and/or alternate missions that can utilize many baseline missile attributes.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued development of Joint P3I Phase 1 improvements begun in FY 1991. Improvements include compressed carriage to increase the number of AMRAAMs on the F-22 and other advanced aircraft, and electronic counter-countermeasures (ECCM) to counter existing and emerging threats
- (U) Conducted Preliminary Design Review for Phase 1 of P3I
- (U) Initiated instrumented vehicle and jettison tests for compressed carriage missiles

2. (U) FY 1993 Planned Program:

- (U) Continue development of improvements begun in FY 1991
- (U) Conducted the Critical Design Review for Phase 1, Jan 93
- (U) Provide proof-of-design/manufacturing (POD/POM) hardware for subsystem and system level testing
- (U) Conducted compressed carriage Separation/Control Test Vehicle tests
- (U) Complete wind tunnel tests for compressed carriage missiles

3. (U) FY 1994 Planned Program:

- (U) Continue the development of Phase 1 improvements begun in FY 1991
- (U) Initiate Phase 1 flight tests against targets
- (U) Begin the Joint Phase 2 development efforts for ECCM and lethality improvements

4. (U) Program to Completion:

- (U) Complete Phase 1 development and continue production implementation into Lot 8 (FY1994 buy)
- (U) Complete Phase 2 development in FY 1998 with production incorporation in FY 1999. In FY1995 initiate Joint AF/Navy missile bank-to-turn/propulsion demonstration
- (U) Initiate Joint AF/Navy Phase 3 studies in FY1995 to support future Joint Service requirements for improved ECCM, kinematics, and weapon effectiveness

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Program Element: #0207163F
PE Title: Advanced Medium Range
Air-to-Air Missile (AMRAAM)

Project Number: 3777
Budget Activity: #4 - Tactical Programs

- (U) Complete Phase 3 studies and initiate engineering development, in late FY 1997 or FY 1998 of those efforts required to counter the evolving threat
- (U) This is a continuing program

D. (U) WORK PERFORMED BY: This program is managed by the AMRAAM Joint System Program Office at the Aeronautical Systems Center, Eglin AFB FL. Production contracts have been awarded to Hughes Aircraft Company, Tucson AZ and Raytheon Company, Bedford MA. A cost plus contract was awarded to Hughes (with Raytheon as a major subcontractor) to perform the AMRAAM P3I development effort. Production competition will be retained.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: The full-rate production approval slipped 30 days due to scheduling of the Defense Acquisition Board (DAB) Program Review (Apr 92). P3I Phase 1 first production delivery was delayed one quarter due to availability of hardware for system level integration. The AMRAAM P3I Phase 2 Contract Award date was accelerated based on OSD direction to accelerate Phase 2 lethality efforts.
3. (U) COST CHANGES: Fiscal years 1992 and 1993 have a slight change for inflation and Congressional action. Fiscal year 1994 has increased based on the April 1992 DAB decision to accelerate lethality improvements. This acceleration includes (1) specific ECCM techniques and (2) further definition of Phase 2 technical content for ECCM and lethality. Phase 3 funds added for early requirements analysis studies beginning in FY 1995.

F. (U) PROGRAM DOCUMENTATION:

- MENS	Nov 78	TEMP	Apr 92
- SOC	Jul 86	DCP	Mar 91
- SORD	Jan 90	JSOR (USAF ROC 9-76)	May 91
- STAR	Apr 92		

G. (U) RELATED ACTIVITIES:

- (U) AMRAAM integration with the following programs: Program Element #0207130F (F-15), Program Element #0207134F (F-15E), Program Element #0207133F (F-16), Program Element #0604239F (F-22), Program Element #0205667N (F-14), Program Element #0204136N (F/A-18), Program Element #0604314N (AMRAAM (Navy RDT&E)) Program Element #0204162N, #0206138M, AMRAAM (Navy Proc)
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense
- (U) Joint Potential Designator: Joint

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Program Element: #0207163F Project Number: 3777
 PE Title: Advanced Medium Range Budget Activity: #4 - Tactical Programs
Air-to-Air Missile (AMRAAM)

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands)

1. (U) Procurement: (Missile Procurement, BA 2, P-1 Line Item 12)

	FY 1992 <u>Actual</u>	FY 1993 <u>Actual</u>	FY 1994 <u>Estimate</u>	TO <u>COMPLETE</u>	TOTAL <u>PROGRAM</u>
PE 0207163F, AMRAAM Proc					
Cost	543,585	629,972	496,128	3,220,390	8,599,896
Quantity	700	1000	725	4,341	9623
PE 0207590F, SEEK EAGLE					
Cost			13,788	68,846	87,304
Quantity			24	117	153
TOTAL					
Cost	543,585	629,972	509,916	3,289,236	8,687,200
Quantity	700	1000	749	4,458	9,776

2. (U) Military Construction: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: No cooperative agreements with Foreign Governments exist at this time for a P3I version of the AMRAAM missile system. Germany withdrew from the Family of Advanced Air-to-Air Weapons Memorandum of Understanding (MOU) between the Federal Republic of Germany (GM), the United Kingdom (UK), and the United States (US). The US and UK agreed that the MOU was terminated due to UK failure to complete the ASRAAM program within the MOU time frame. A formal termination letter was sent from DEPSECDEF to the UK on July 30, 1992.

J. (U) MILESTONE SCHEDULE:

1. (U) Milestone IIIA (Low Rate Initial Production)	June 1987
2. (U) Award AMRAAM P3I EMD Contract	March 1991
3. (U) Milestone IIIB Review	May 1991
4. (U) Initial Operational Capability	September 1991
5. (U) Full Rate Production Approval	April 1992
6. (U) AMRAAM P3I Phase 2 Contract Award	1 Qtr, CY 1994
7. (U) P3I Missile Free Flight Test Initiated	1 Qtr, CY 1994
8. (U) P3I Phase 1 First Production Delivery (Lot 8)	3 Qtr, CY 1996
9. (U) Additional Production Changes	4 Qtr, CY 1998

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
 PE Title: Follow-On Tactical
 Reconnaissance System

Budget Activity: #4 - Tactical
Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3201	Tactical Air Reconnaissance System (TARS)				
	17,570	12,000	5,500	4,500	204,800
3652	Joint Service Imagery Processing System (JSIPS)				
	6,000	6,638	10,500	23,100	152,638
3792	F-16R				
	63,821	39,724	49,338	119,300	272,183
Total	87,391	58,362	65,338	146,900	629,621

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Follow-On Tactical Reconnaissance System (FOTRS) is an umbrella tactical reconnaissance improvement effort. The program's objective is to meet our tactical commanders' requirement for timely imagery intelligence information. FOTRS will replace the current film-based imaging and wet-film processing systems with a digital imaging and processing system capable of providing real-time/near-real-time tactical reconnaissance information. FOTRS development consists of an airborne portion called the Advanced Tactical Air Reconnaissance System (ATARS) and a ground portion called the Joint Services Imagery Processing System (JSIPS). The USAF portion of ATARS consists of two development projects: Project 3201, Tactical Air Reconnaissance System (TARS), and Project 3792, a reconnaissance capable F-16C named the F-16R. TARS focuses on the full scale development of digital electro-optical and infrared sensors, datalink, recorders, and management system. A single TARS sensor, either day or night sensor, will be the payload on the USAF, USN, and USMC Medium Range Unmanned Aerial Vehicle (MR-UAV). The USMC F/A-18D(RC) will carry TARS sensors on a pallet which is interchangeable with the gun pallet. The F-16R project will develop a tactical reconnaissance pod and modify existing F-16s to provide "hands-on, head-up" cockpit reconnaissance controls. The USAF will integrate TARS into the reconnaissance pod for carriage on the F-16R. JSIPS is known as Project 3364. JSIPS, a joint-Service effort, focuses on the development of a ground station capable of receiving, processing, exploiting, and disseminating multi-sensor tactical imagery (EO/IR/radar) from Air Force, Navy, and Marine Corps manned and unmanned systems. The USAF will use a Mission Verification System (MVS) at the unit level capable of first phase exploitation, training feedback and verification of sensor suite performance.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F

Project: # 3201

PE Title: Follow-On Tactical

Budget Activity: #4 - Tactical

Reconnaissance System

Programs

Project Title: Tactical Air Reconnaissance System

POPULAR NAME: TARS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	Rebaselined Program - Aug	N/A	N/A	Low-Rate Prod Decision - LRIP FY 1/95; MSIII - FY1/98
Engineering Milestones	N/A	Hardware Deliveries - Jan	System Functional Configuration Audit - Jul	N/A
T&E Milestones	RF-4C CFT Continued	RF-4C DT&E/OA - Feb; F/A-18D(RC) CFT - Apr	F/A-18D(RC) DT/OT - Jan; UAV-MR DT - Jun	Multi-Service Operational Test Support for JSIPS - FY 3/94
Contract Milestones	N/A	N/A	Production Readiness Review - Feb	LRIP Contract Award - FY 2/95
Budget (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	13,500	1,000	0	149,694 (0)
Support Contract	700	440	500	9,517 (1,600)
In-House Contract	1,200	801	800	11,784 (2,900)
GFE/Other	2,170	9,759	4,200	33,805 (0)
Total	17,570	12,000	5,500	204,800 (4,500)

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3207
Budget Activity: #4 - Tactical
Programs

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Tactical Air Reconnaissance System (TARS) is an engineering and manufacturing development (EMD) project which meets the needs of tactical commanders for responsive and timely location and classification of tactical targets. This project focuses on the development of a common sensor suite consisting of Electro-Optical (EO) and Infrared (IR) sensors, data link, recorders and reconnaissance management system for carriage on USAF, USMC, and USN manned and unmanned tactical reconnaissance systems. The Air Force will integrate the sensor suite into a reconnaissance pod for the F-16R. Also, either a day or night TARS sensor, with supporting subsystems, will be the reconnaissance payload for the Unmanned Aerial Vehicle-Medium Range (UAV-MR). The Air Force designation for the UAV-MR with the TARS payload is the Unmanned Air Reconnaissance System (UARS). The RF-4C will serve as a sensor validation test bed in support of F/A-18D(RC), F-16R, and UAV-MR integration testing.
- C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
1. (U) FY 1992 Accomplishments:
 - (U) Continued contractor flight testing on the RF-4C.
 - (U) Contract modification signed on August 20, 1992.
 - (U) Rebaselined the TARS effort.
 2. (U) FY 1993 Planned Program:
 - (U) Finish contractor flight testing.
 - (U) Accept two TARS sensor suites for government flight test.
 - (U) Begin TARS Development Test & Evaluation (DT&E) on RF-4C.
 - (U) Complete Phase II of the maintainability demonstration
 - (U) Begin Phase III maintainability demo (F/A-18D).
 - (U) Continue environment qual test of line replaceable units.
 - (U) Continue first lifetime durability testing.
 - (U) Accept the three F/A-18D(RC) sensor suites.
 - (U) Begin F/A-18D(RC) contractor flight testing.
 3. (U) FY 1994 Planned Program:
 - (U) Complete TARS Operational Assessment (OA) on the RF-4C.
 - (U) Complete Phase III maintainability demo (F/A-18D).
 - (U) Complete environment qual test of line replaceable units.
 - (U) Complete first lifetime durability testing.
 - (U) Begin and complete second lifetime durability testing (verify corrective action).
 - (U) Complete F/A-18D(RC) contractor flight testing.
 - (U) Conduct F/A-18D(RC) DT&E and Operational Testing.
 - (U) Government acceptance of three EO and three IR TARS sensors for the UARS.
 - (U) Integrate the TARS sensors and UAV nose assemblies.
 - (U) Conduct UARS contractor flight testing/begin UARS DT&E.

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3201
Budget Activity: #4 - Tactical
Programs

4. (U) Program To Completion:

- (U) TARS Low Rate Initial Production (LRIP) decision
- (U) TARS LRIP contract award.
- (U) Complete UARS DT&E.
- (U) Conduct UARS OA.
- (U) UARS Multi-Service Operational Test & Evaluation.
- (U) Complete TARS LRIP.
- (U) TARS MS III decision.

D. (U) WORK PERFORMED BY: The prime contractor for the Tactical Air Reconnaissance System (TARS) development is Martin Marietta of, Orlando FL. The Aeronautical Systems Center, Wright-Patterson AFB OH, has in-house management responsibility for system development. Subcontractors supporting the TARS project are as follows:

E-Systems	Greenville, Tx	RF-4C Group A
Loral Fairchild Systems	Syosset, NY	EO Sensors
LIRIS	Lexington, Ma	IR Line Scanner
Datatype	Pasadena, Ca	Digital Tape Unit
Paramax	Salt Lake City, Ut	Data Link
Computing Devices	Hastings, UK	Management System

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

1. (U) TECHNICAL CHANGES: The August 20, 1992 contract modification changed the sensor suite support equipment from the Reconnaissance Modular Automated Test Set (RMATS) to the Consolidated Automated Support System (CASS).
2. (U) SCHEDULE CHANGES: Delays in hardware deliveries have extended the contractor flight test (CFT) period, requiring a reevaluation of achievable program milestone dates and a rebaseline of the effort. As part of the signed contract modification, the schedule has been reset as noted in Part C., Program Accomplishments and Plans. The Low Rate Initial Production decision has been moved from June 1992 to FY1/95 in order to complete the required testing.
3. (U) COST CHANGES: The delays in the start of government testing have required funding adjustments for the TARS project in FY92 and beyond as noted in Part A., Resources. In FY92, \$4M of the \$32M Congressional add was applied to the sensor suite effort for risk reduction, per Congressional direction. The remaining \$28M was distributed to efforts outside the FOTRS program element per Congressional and OSD direction. The distribution of the \$28M is addressed under the F-16R project, E.3. COST CHANGES. The August 20, 1992 contract modification added \$32.4M to the TARS contract for government liability and technical changes. FY 93 also includes the \$7M Congressional add, minus inflation adjustments, for the contract modification.

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Program Element: #0207217F
 PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3201
 Budget Activity: #4 - Tactical
Programs

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON, 7 Aug 79
- (U) MENS, May 81
- (U) JMENS, Mar 82
- (U) SDDM, 30 Mar 87
- (U) TAF SON, 18 Dec 87
- (U) PDM, 14 Jul 88
- (U) TEMP, 10 May 89
- (U) TAF SORD, 13 Jul 92

G. (U) RELATED ACTIVITIES:

- (U) PE 0305141D, DOD Joint Unmanned Air Vehicle Program.
- (U) PE 0207133F, F-16.
- (U) PE 0204136N, F/A-18.
- (U) PE 0207213F, EO Long Range Oblique Photography (EO LOROP).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

(U) Procurement (3010, BA05/06/07):

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost*	0	13,141	13,443	363,521	390,105
Qty**		0	0	50	50

* Funds pods/sensor suites/F-16R Mod Kits
 ** Reflects sensor suite quantities

(U) Military Construction: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None. However, a number of NATO and non-NATO countries interested in TARS have requested Price and Availability (P&A) data.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
Contractor Flight Test	Feb 91	Low Altitude Electro-Optical (LAEO) Sensor--100% Successful
Contractor Flight Test	Jun 91	LAEO & Infrared Linescanner (IRLS)--75% Successful--faulty RF-4C radar altimeter; imagery distortion at low altitude; less distortion at higher altitude
Contractor Flight Test	Jul 91	LAEO & IRLS--90% Successful--Instrumentation (circuit breaker problem); all primary test points; 2 secondary test points on IRLS completed; good imagery
Contractor Flight Test	Jul 91	IRLS--100% Successful

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Program Element: #0207217F
 PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3201
 Budget Activity: #4 - Tactical
Programs

Contractor Flight Test	Sep 91	LAEO, IRLS, Data Link to Spectrum Analyzer--80% Successful--good imagery; weaker than expected data link signal prevented antenna pointing test
Contractor Flight Test	Nov 91	LAEO, Medium Altitude Electro-Optical (MAEO), IRLS, data link--85% Successful--faulty radar altimeter; good dual recorder operation, LAEO & IRLS imagery; MAEO stabilization, imagery contrast, banding problems
Contractor Flight Test	Nov 91	Datalink environmental--100% Successful
Contractor Flight Test	Dec 91	Datalink environmental--100% Successful
Contractor Flight Test	Apr 92	IRLS without compression--100% Successful
Contractor Flight Test	Jul 92	IRLS with compression--25% Successful; bad compression - decompression card
Contractor Flight Test	Jul 92	IRLS with compression--100% Successful (IRLS baselined)
Contractor Flight Test	Jul 92	IRLS & LAEO--100% Successful
Contractor Flight Test	Aug 92	MAEO--80% Successful; Lens focus and inadequate stabilization during roll test
Contractor Flight Test	Aug 92	LAEO, MAEO, IRLS, two recorders, datalink environmental test--100% Successful
Contractor Flight Test	Aug 92	MAEO Functional Evaluation--80% Successful; Focus/Stability
Contractor Flight Test	Sep 92	Environmental Test w/Full Suite--100% Successful
Contractor Flight Test	Sep 92	Environmental Test w/Full Suite--100% Successful. 2nd Test
Contractor Flight Test	Oct 92	Demonstrate Real-time Data link w/JSIPS--20% Successful; Header information
Contractor Flight Test	Nov 92	MAEO Stabilization Data (Active)--100% Successful
Contractor Flight Test	Nov 92	MAEO Stabilization Data (Inert)--100% Successful
Contractor Flight Test	Dec 92	Data Link Test--80% Successful
Contractor Flight Test	Dec 92	MAEO Stabilization Data--100% Successful
DD 250	Jan 93	Govt Acceptance of First Suite
DD 250	Feb 93	Govt Acceptance of Second Suite
DT&E/OA Start	Feb 93	RF-4C Government Flight Test

T&E ACTIVITY (To Completion)

<u>Event</u>	<u>Date</u>	<u>Results</u>
DT/OT Start	FY 2/94	F/A-18D Government Flight Test
DT&E/OT Start	FY 3/94	Unmanned Air Reconnaissance System (UARS) - MR-UAV with ATARS sensor suite

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
 PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3364
 Budget Activity: #4 - Tactical
Programs

Project Title: Joint Service Imagery Processing System

POPULAR NAME: JSIPS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	N/A	Low Rate Production Decision - Feb	N/A	MS III - FY 3/95
Engineering Milestones	Tac JSIPS Integration Continues	Functional & Physical Config Audit - Jan	N/A	N/A
T&E Milestones	Nat'l JSIPS DT&E - Nov	Tac JSIPS DT&E - Feb	Tac JSIPS Multi-Service OT&E - May	JSIPS Support for TARS-equipped Platforms
Contract Milestones	Tactical JSIPS to Eglin - Jul	LRIP Contract Award - Aug	MVS Contract - Dec 93	Continue Prod Thru FY02
Budget				Program Total
(\$000)	FY 1992	FY 1993	FY 1994	(To Complete)
Major Contract	1,900	0	5,000	65,900 (5,000)
Support Contract	2,000	5,038	3,900	46,112 (12,500)
In-House Contract	1,200	700	700	28,412 (3,100)
GFE/Other	900	900	900	12,214 (2,500)
Total	6,000	6,638	10,500	152,638 (23,100)

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3364
Budget Activity: #4 - Tactical
Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Joint Service Imagery Processing System (JSIPS) provides a common transportable system capable of receiving, processing, exploiting, and disseminating, in softcopy or hardcopy, digital imagery. JSIPS will replace the costly and manpower/logistics intensive Photo Processing and Interpretation Facilities (PPIFs) associated with the RF-4C. JSIPS can be configured in one of three ways: National Receive Segment; Tactical Receive Segment; or National and Tactical Receive Segments. JSIPS will meet the Tactical Commander's need for timely and responsive imagery for the detection, location and classification of tactical targets. The tactical JSIPS will support USAF, USN, and USMC manned and unmanned reconnaissance vehicles carrying the Tactical Air Reconnaissance System (TARS) sensor suite. Under the JSIPS project, the USAF will also develop a Mission Verification System (MVS) for unit-level operations. The MVS supports training, sensor maintenance, and is capable of first phase exploitation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed Tactical Radar Correlator and hardcopy exploitation segment integration into the US Army's National JSIPS Engineering Development Model (EDM).
- (U) Shipped US Army EDM to Germany.
- (U) Conducted functional qualification testing and operational assessment of the EDM.
- (U) Completed environmental and mobility testing of the US Air Force/Marine Corps Tactical JSIPS EDM (B/C configuration).
- (U) Began airborne to ground datalink integration.
- (U) Shipped B/C configuration to Eglin AFB, FL.
- (U) Conducted Phase I of the tech order validation.
- (U) Began ATARS training in preparation of DT&E start at Eglin AFB, FL.

2. (U) FY 1993 Planned Program:

- (U) National JSIPS Low Rate Initial Production decision and contract award.
- (U) Complete ATARS training for DT&E of the Tactical JSIPS at Eglin AFB, FL.
- (U) Conduct system functional qualification testing of the Tactical JSIPS.
- (U) Ship National Input Segment (NIS) to Eglin.
- (U) Conduct reliability test on the dual-capable JSIPS - National and Tactical capability.
- (U) Conduct operations and maintenance testing on the dual-capable JSIPS.
- (U) Conduct OT&E operator training.
- (U) Begin DT&E in conjunction with the TARS-equipped RF-4C.

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3364
Budget Activity: #4 - Tactical
Programs

3. (U) FY 1994 Planned Program:

- (U) Support 44 ATARS flights for AFOTEC and ATARS LRIP decision.
- (U) On the dual-capable JSIPS, conduct: maintainability demonstration; TEMPEST testing; continue government DT&E; system accreditation of the NIS; FCA/PCA, and DD 250.
- (U) Conduct OT&E operator training.
- (U) Begin Multi-Service Operational Test and Evaluation
- (U) Complete JSIPS MOT&E.

4. (U) (U) Program to Completion:

- (U) JSIPS Milestone III decision.
- (U) Award JSIPS full rate production contract.
- (U) Continue to support platform testing.
- (U) Field system.

D. (U) WORK PERFORMED BY: The contractor for full-scale development of the Joint Service Imagery Processing System (JSIPS) is E-Systems, Garland TX. Electronic Systems Center, Hanscom AFB MA, has responsibility for in-house management. Subcontractors supporting the JSIPS project are as follows:

Brunswick	Marion, Va	Shelters
CALSPAN	Alexandria, Va	CATIS Augmentation
Autometric	Alexandria, Va	Hard Copy Exploitation
Datatape	Pasadena, Ca	Digital Tape Unit
Paramax	Salt Lake City, Ut	Data Link
CONTEL	Westlake Village, Ca	IWS Software Testing/ CATIS Integration

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Five of the 14 Air Force Mission Verification Systems (MVSS) will have a datalink capability and will support unit-level operations--training and sensor maintenance.
2. (U) SCHEDULE CHANGES: The delay in Tactical Air Reconnaissance System (TARS) sensor suite hardware deliveries and completion of ICD compliant ATARS tape for testing have delayed the completion of the B/C Test Schedule. The Tactical JSIPS testing schedule and production decision has been realigned as noted in Section C., Program Accomplishments and Plans.
3. (U) COST CHANGES: The increase in the JSIPS funding in FY94 and beyond is attributable to the schedule changes and the addition of the datalink capability to the MVS. A program increase will provide for additional geo-positioning and targeting data.

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3364
Budget Activity: #4 - Tactical
Programs

F. (U) PROGRAM DOCUMENTATION:

- (U) SOC, Jan 87
 - (U) Son, USAF 002-85, Feb 88
 - (U) TEMP, Dec 89*
 - (U) JSORD, Dec 90*
- * These documents are being updated.

G. (U) RELATED ACTIVITIES:

- (U) MOAs with USN, USA and USMC. PE 060373A and PE 0604718M.
- (U) PE 0207435F, MVS and national/tactical JSIPS procurement.
- (U) PE 0207213F, Class V Modifications, Electro-Optical Long Range Oblique Photography System (EO LOROPS) funding.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

(U) Procurement (3080):

PE	FY 1992	FY 1993	FY 1994	To	Total
<u>0207435F</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	21,962	15,751	5,000	107,100	149,700
Qty					
JSIPS*	0	.5	0	1.5	2
MVS	0		1	13	14

*Note: JSIPS quantities reflect national (.5) and tactical segment (.5) procurement to achieve two dual-capable systems.

(U) Military Construction: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

- In the tables below, "B/C" configuration refers to the USAF/USMC tactical JSIPS Engineering Development Model (EDM) used to support ATARS testing. The "D" configuration refers to the Army's EDM, with "D1" being the softcopy capability and "D2" being the hardcopy capability through the JSIPS Hardcopy Exploitation System (HES).

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
Altitude Chamber Tests (B/C)	Jul 91	Successful
Environmental Testing (B/C)	Aug 91	Successful
Environmental Testing (B/C)	Oct 91	Successful
Interim Accreditation (D1)	Oct 91	Successful
Communications Support Segment (CSS) Functional Qualification Test (FQT) (D2)	Nov 91	Successful
Operational Assessment (D)	Jan 92	Partially Successful (reassessment scheduled)
System Support Segment (SSS) FQT (D)	Feb 92	Successful

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
 PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3792
 Budget Activity: #4 - Tactical
Programs

Project Title: F-16R

POPULAR NAME: Recce Falcon

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	N/A	EMD Start - Jul	N/A	Long-lead Prod for pods & kits - FY 1/97
Engineering Milestones	Time & Materiel Effort - Jan	N/A	Prelim Design Review - Oct; Critical Design Review - Jul	N/A
T&E Milestones	N/A	N/A	N/A	Pod Cert. - FY 4/94; DT/IOT&E - FY 4/96
Contract Milestones	ACSN Released - Oct	EMD Contract Award - Jul	First Pod - Aug	First F-16R - FY 4/98
Budget (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	32,752	38,482	39,838	204,872 (93,800)
Support Contract	0	400	4,900	6,800 (1,500)
In-House Contract	3,069	842	4,600	16,211 (7,700)
GFE/Other	28,000	0	0	44,300 (16,300)
Total	63,821	39,724	49,338	272,183 (119,300)

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3792
Budget Activity: #4 - Tactical
Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The CINCs and the Joint Staff support the Air Force's requirement for a follow-on manned tactical reconnaissance system to replace the aging RF-4C. A reconnaissance capable F-16, designated as the F-16R, meets the requirement in capability and cost-effectiveness. The F-16R project focuses on modifying existing F-16 aircraft to provide a day/night reconnaissance capability through a fully integrated tactical reconnaissance pod containing the Tactical Air Reconnaissance System (TARS). The F-16R will use existing hardware to provide the pilot with a "hands-on, head-up" capability. The TARS-equipped F-16R will be compatible with the Joint Service Imagery Processing System. This project builds on planning and demonstrations previously conducted for the Follow-On Tactical Reconnaissance System in the 1986 F-16 reconnaissance demonstration/validation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Began Time and Materiel risk reduction efforts to span the gap until the Engineering and Manufacturing Development (EMD) contract is awarded to minimize program slips.
- (U) Established division of development responsibilities between F-16R and Tactical Air Reconnaissance System (TARS).
- (U) Initiated Associate Contractor Agreements
- (U) Set up interface control working groups.
- (U) Began developing the Interface Control Documents between the F-16R and TARS projects

2. (U) FY 1993 Planned Program:

- (U) Conduct cockpit missionization simulation to determine pilot/vehicle interface (displays and controls).
- (U) Define software design requirements.
- (U) Define partition of software tasks between F-16 avionics.
- (U) Design modification kit.
- (U) Conduct pod design vibration, structural, and aerodynamic analysis.
- (U) Complete preliminary pod drawings.
- (U) Continue to develop the ICD through monthly technical interchange and interface control working groups.
- (U) Conduct F-16R stability and control, aerodynamic, electromagnetic compatibility, and HAVE GLASS analyses.
- (U) Begin definition of maintenance and aircrew training requirements.
- (U) Begin logistics support analysis.
- (U) Begin preliminary flight test instrumentation drawings.
- (U) Begin to prepare test plans.
- (U) Develop manufacturing plan.
- (U) Award EMD contract.

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Program Element: #0207217F
PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3792
Budget Activity: #4 - Tactical
Programs

3. (U) FY 1994 Planned Program:
 - (U) Preliminary Design Review (PDR).
 - (U) Critical Design Review (CDR).
 - (U) Delivery of first pod.
 - (U) Begin TARS/pod integration.
 - (U) Begin pod certification.
 - (U) Conduct wind tunnel tests.
 - (U) Modify F-16R Computer.
4. (U) Program to Completion:
 - (U) Complete TARS/pod integration.
 - (U) Complete test aircraft modification.
 - (U) Complete test instrumentation modification.
 - (U) Operational Flight Program (OFP) release for flight testing.
 - (U) Continue SEEK EAGLE testing: vibration; flutter; loads; jettison; structural; UARS separation/launch; TARS pod flight clearance; UARS flight clearance; analysis and tech order generation.
 - (U) Conduct F-16R/UARS integration development testing.
 - (U) Complete SEEK EAGLE testing.
 - (U) Conduct F-16R OFP DT&E.
 - (U) Conduct F-16R/TARS DT&E at Eglin AFB, FL.
 - (U) Conduct F-16R/EO-LOROPS DT&E at Eglin AFB, FL.
 - (U) Conduct F-16R system DT&E.
 - (U) Conduct F-16R system IOT&E.
 - (U) Deliver first F-16R in FY 4/98.
 - (U) Deliver twelfth F-16R in FY 3/99.
- D. (U) WORK PERFORMED BY: Proposal released to General Dynamics, Fort Worth, Texas. The Aeronautical Systems Division, Wright-Patterson AFB OH, has in-house responsibility for system development.
- E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:
 1. (U) TECHNICAL CHANGES: None.
 2. (U) SCHEDULE CHANGES: The FY92 start, vice FY91 start, of the F-16R effort has required adjustments to the schedule, as noted in Section C., Program Accomplishments and Plans.
 3. (U) COST CHANGES: The schedule adjustment required associated funding adjustments in FY93 and beyond, as noted Section A., Schedule/Budget Information. The cost increases are attributable to the delayed start, low cost estimates for the FY92/93 budgets, and inflation impacts. Actual budget authority in FY92 for the F-16R project is \$35,821M. The remaining \$28M was distributed to efforts outside the FOTRS program in accordance with Congressional and OSD direction: \$14.7M to the Airborne Imagery Transmission (ABIT) relay program office; \$9.2M to the Low Volume Dissemination System (LVDS) program office; and \$4.1M to Rome Air Development Center (RADC) for a JSIPS database/software upgrade.

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Program Element: #0207217F
 PE Title: Follow-On Tactical
Reconnaissance System

Project: # 3792
 Budget Activity: #4 - Tactical
Programs

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON, 7 Aug 79
- (U) MENS, May 81
- (U) JMENS, Mar 82
- (U) SDDM, Mar 87
- (U) TAF SON, Apr 88
- (U) PDM, Jul 88
- (U) SORD, 30 May 91

G. (U) RELATED ACTIVITIES:

- (U) PE 0207133F, F-16.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

(U) Procurement (3010, BA05/06/07):

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Cost*	0	13,141	13,443	363,521	390,105
Qty**					
Pods	0	0	0	62	62
Kits	0	0	0	80	80

* Funds Pods/Sensor Suites/F-16 Mod Kits
 ** Sensor suite quantities are shown under the TARS project.

(U) Military Construction: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None. A number of countries have expressed interest in procuring populated pods once the USAF develops the pods.

J. (U) TEST AND EVALUATION DATA:

<u>Event</u>	<u>T&E ACTIVITY (PAST 36 MONTHS)</u> <u>Date</u>	<u>Results</u>
N/A	N/A	N/A

<u>Event</u>	<u>T&E ACTIVITY (TO COMPLETION)</u> <u>Date</u>	<u>Remarks</u>
Pod Certification	FY 94	None.
DT&E and OT&E	FY 96	None.
OT&E Complete	FY 97	None.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207247F
 PE Title: Air Force TENCAP

Project Number: 0001
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete cont</u>	<u>Total Program TBD</u>
TENCAP	858	4099	14,722		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Tactical Exploitation of National Capabilities (TENCAP) program objective is to improve national systems support for combat operations. This includes: 1) educate warfighters about national systems, 2) Advocate tactical missions for new national systems, 3) Influence the design and operation of new national systems, and 4) Exploit tactical use of existing systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments

- TALON JADE: Support PACOM Korean exercise.
- Readiness: Organize, train, equip Forward Space Support Teams to support JFACC & combat units; Space Tactics Model; run School House.
- TALON SWORD: Explore use of national information in-cockpit; Support Advanced Defensive Avionics Response Strategy program.
- JCS Special Project 93: Act as JCS executive agent.
- TALON SCENE/STAMP: Support precision guided weapons programs.
- ELLIPSE CHARLIE: Support SOF exercise.

2. (U) FY 1993 Planned Program:

- Execute JCS Special Project 93.
- Establish the Space Applications Project Office.
- TALON HOOK: Support Combat Survivor/Evader Locator Program.
- Air/Space Tactics Center: Support planned USAFE center.
- BLACK FLAG: Support development of AF doctrine and tactics.
- TALON LINK: Interface TENCAP simulation and wargaming with exercise and training.
- TENCAP Communications: Provide links to support deployed AF units.
- Intelligence Support Plans: Support development of intelligence requirements for specific weapons systems.

3. (U) FY 1994 Planned Program:

- Restructure and expanded program in direct response to significant changes underway in the national systems architecture.
- Influence design of emerging national systems and begin development of national systems to match.
- Develop prototypes to support operational concept and architecture development and to support real-world operations.
- Increase technical support for exercises and contingencies.
- Integrate Air Force requirements into future national systems.
- Integrate future national systems into Air Force C⁴I and weapon systems.

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Program Element: #0207247F
PE Title: Air Force TENCAP

Project Number: 0001
Budget Activity: #4 - Tactical Programs

4. (U) FY 1995 Planned Program:

- Maintain national systems baseline.
- Influence design of new National systems.
- Provide technical support to AF Space Command for exercise and contingencies.
- Develop prototypes as required to support Ops Concepts and architecture development.
- Integrate new national capabilities into AF C4I and weapons systems.
- Educate AF on emerging capabilities.

5. (U) Program Completion:

- Maintain National systems baseline.
- Influence design of new National systems
- Provide technical support to AF Spacecommand for exercise and contingencies.
- Develop prototypes as required to support Ops Concepts and architecture development.
- Integrate new national capabilities into AF C4I and weapons systems.
- Educate AF on emerging capabilities.

D. (U) WORK PERFORMED BY: Field Operating Agent is Air Force Space Command, Peterson AFB, Colorado. Support Command is Air Force Material Command, Space and Missile Center, Los Angeles AFB, California. There are three prime support contractors at this time: 1) Autometrics Inc., 2) McDonnell Douglas, and 3) Space Applications Corp. These contractors provide technical, exercise and demonstration support along with prototype development and acquisition.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: The TENCAP program is undergoing a major restructure. This restructure will increase AF emphasis on exploiting national systems, influencing new national systems and architectures, integrating national capabilities into AF C4I weapon systems, and the formulation of a Space Applications Project Office. The AF is committed to make TENCAP a force multiplier for enhancing the effectiveness and survivability during air sorties on combat missions.
2. (U) Schedule Changes: Not Applicable
3. (U) Cost Changes: Program increase from a \$400,000 per year program to a \$15 million per year program is due to the restructure of TENCAP caused by the post Desert Storm emphasis and significant changes to national systems. These funds are to support Space Applications Project Office to accomplish the technical changes described above.

F. (U) PROGRAM DOCUMENTATION:

- (U) 1977 House/Senate Joint Appropriations Conference Committee directed the AF to establish and maintain TENCAP organization.
- (U) HQ Pamphlet 21-1 (U), Mission Statement for the National systems Requirements and Integration Division (HQ USAF/XORR), assigns AF/XORR as the Office of Primary Responsibility for the AF TENCAP program.
- (U) PD/NSC-37 (U), National Space Policy direct the AF to be directly involved in specifying the requirements to influence the design of future National space systems.
- (U) Defense Appropriations Bill, 1980, report No. 96-450 (TS-SI/TK), Emphasized TENCAP should provide input in determining capabilities of all new national systems.

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Program Element: #0207247F
PE Title: Air Force TENCAP

Project Number: 0001
Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:

- (U) Program #0305159I, Defense Reconnaissance Support Program
- (U) Program Element #0305158F, Constant Source
- (U) Program Element #0304111F, Special Activities
- (U) Program Element 0301313F, Defense Dissemination System
- (U) TENCAP formally interfaces with numerous national programs/agencies, the Major Commands and their components, the Air Staff, Office of the Secretary of Defense, Secretary of the Air Force, and the other Services in order to effectively influence the designs and concepts of the national systems.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Other Procurement (PE #0207247F, BA #4):

	FY 1992	FY1993	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	109	129	0	238

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

There are no major milestones for this Program.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207411F
PE Title: Overseas Air Weapon Control Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
1002 Theater Missile Defense (TMD) C3I	0.00	0.00	11,455	Cont	TBD
1003 Theater Missile Defense (TMD) Integration	0.00	0.00	8,115	Cont	TBD
2704 EIFEL	<u>1,883</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>30,473</u>
Total	1,883	0.00	19,570	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides the Theater Missile Defense new start program funds for initial requirements definition, weapon system analysis, simulations, and demonstrations to determine the best solution set for TMD. The program element also funds development, integration, and weapon/sensor refinements against theater missiles of all classes (tactical ballistic, cruise, and air-to-surface). Lastly, it funded the US portion of five nation cooperative program to upgrade four command and control centers in NATO's Central Region from the Einsatzbereitschaft der Luftwaffe (EIFEL) system to the EIFEL 1 Lifetime Extension.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994 :

1. (U) 1002, Theater Missile Defense (TMD) C3I:

This project funds initial requirements definition, weapon system analysis, simulations, and demonstrations to determine best solution set for theater missile defense.

(U) FY 1992 Accomplishments:

- (U) None. This project is a new start in FY 1994.

(U) FY 1993 Planned Program:

- (U) Not applicable.

(U) FY 1994 Planned Program:

- (U) Complete combat user's Strategies-to-Task study for requirements definition.
- (U) Determine technologies to explore for development and demonstration.
- (U) Begin development efforts for near-term demonstration.

(U) Program to Completion:

- (U) Complete and integrate weapon system enhancements to meet the mission requirements of Theater Missile Defense.
- (U) This is a continuing program.

(U) Work Performed By: In-house program performed by Air Force Material Command's Space and Missile Systems Center, Electronics Systems Center, Aeronautics Systems Center, and Air Combat Command requirements directorate.

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Program Element: #0207411F
PE Title: Overseas Air Weapon Control Systems

Budget Activity: #4 - Tactical Programs

(U) RELATED ACTIVITIES:

- (U) Program Element #0603605F, (Advanced Radiation Technology)
- (U) Program Element #0603617F, (Command, Control & Communications Applications)
- (U) Program Element #0604249F, (Night Precision Attack)
- (U) There is no unnecessary duplication of effort within the Air Force or the department of Defense.

(U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

2. (U) 1003, TMD Integration:

This program element funds efforts to develop advanced weapons and C3I technology. Emphasis is on TMD C3I integration efforts throughout the Air Force to maximize the management of theater defense assets. Funds will go toward analysis to near-term technology improvements, simulations, and demonstrations of C3I and possible weapon system applications. This project is a new start.

(U) FY 1992 Accomplishments:

- (U) Not Applicable. This project is a new start in FY 1994.

(U) FY 1993 Planned Program:

- (U) Not applicable. This project is a new start in FY 1994.

(U) FY 1994 Planned Program:

- (U) Begin C3I and weapon system simulation and analysis.
- (U) Begin development of war-fighting doctrinal changes to coincide with system changes model through simulation and analysis.
- (U) Begin developing specific upgrades for demonstration purposes.
- (U) Begin development and integration efforts with the Navy and Army for C3I and weapon systems to counter the theater missile threat.

(U) Work Performed By: In-house project to be performed by Air Force Material Command's Space and Missile Systems Center, Electronics Systems Center, Aeronautics Systems Center, Air Combat Command and various Air Force Laboratories.

(U) Related Activities:

- (U) Program Element #0603605F, (Advanced Weapons Technology)
- (U) Program Element #0603617F, (Command, Control & Communications Applications)
- (U) Program Element #0604249F, (Night Precision Attack)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0207411F
PE Title: Overseas Air Weapon Control Systems

Budget Activity: #4 - Tactical Programs

3. (U) 2704, EIFEL:

US portion of a five nation cooperative program to upgrade the Elektronisches Information und Führungssystem für die Einsatzbereitschaft der Luftwaffe (EIFEL) automated command and control system with the EIFEL I Lifetime Extension (EILE) administered by the German government. Under this effort, the US Air Force is working with the Federal Republic of Germany, Belgium, the Netherlands, and the United Kingdom in the joint development for major software enhancements to fully integrate the EILE system.

(U) FY 1992 Accomplishments:

- (U) Simulation/connectivity to USAFE Warrior Preparation Center.
- (U) Install the Siemens H90 computer to host the EIFEL systems at the software maintenance center.
- (U) EIFEL interface with Advanced Planning System (APS).
- (U) Analysis of EILE and develop plan/schedule.

(U) FY 1993 Planned Program:

- (U) Program complete in FY92.

(U) FY 1994 Planned Program:

- (U) Program complete in FY 92.

(U) Work Performed By: Because of non-performance and an unusable software product, the Dornier contract for the EILE system was terminated. The German law allows only Germans to officially negotiate with the contractor. Since the Germans govern settlement of contractual and legal implications, it is unclear if there are any US termination or penalty costs with Dornier. The Siemens Corporation (German) replaced Dornier as the developing contractor for EILE.

(U) Related Activities:

- (U) Program Element #0207415F, USAFE Command and Control System developed the Wing Command and Control System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Not Applicable.

(U) International Cooperative Agreements: A Memorandum of Understanding (MOU) between the United States and the Federal Republic of Germany was signed in June 1986 for the cooperative software development and implementation of the EILE system. Under this agreement, total US contribution will not exceed 50 million Deutsch Marks. The MOU was supplemented in June 1988 to include the United Kingdom, Belgium, and the Netherlands. The Financial Agreements define each nation's liability as a percentage of the total contract cost within the cap set by the MOU.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207412F
 PE Title: Tactical Air Control
System Improvements

Project Number: N/A
 Budget Activity: #4 - Tactical
Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
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TACSI	19,281	24,543	28,913*	Cont	TBD
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* \$9.6M Contingency TACS Automated Planning System (CTAPS) funds moved into PE 27438.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Tactical Air Control System (TACS) provides the means through which the Air Component Commander exercises control of his forces to accomplish his assigned mission. This program provides for major improvements to the existing TACS which was designed in the 1960s and is now unsupportable. The Tactical Air Control System Improvements (TACSI) RDT&E program consists of Modular Control Equipment (MCE) Pre-Planned Product Improvements (P3I). The P3I program is structured into multi-block segments. Block A consisted of the HAVE QUICK radio integration and the AN/TPS-75 radar interface which have already been incorporated into the production line. Block B R&D includes integration of Joint Tactical Information Distribution System (JTIDS) Class 2H terminals, an Automated Air Tasking Order capability (AATO), upgrade to the satellite/troposcatter radio and digital interfaces, and secure anti-jam VHF radios. The planned Block C includes TADIL J Reissue II, work toward a Theater Missile Defense capability, and the Interim JTIDS Message Standard (IJMS). The program element also includes production for the MCE, the AN/TPS-75 radar, the Anti-Radiation Missile Decoy for the TPS-75, and JTIDS terminals.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments:

- (U) Developed software for receipt of AATO, JTIDS Class 2 terminals, and digital/secure communications upgrades - through Version 6 of 11.
- (U) Incorporated secure, anti-jam VHF radios.
- (U) Began in-plant testing of Block B hardware and software.

2. (U) FY 1993 Planned Program:

- (U) Complete Block B hardware testing
- (U) Continue Block B software development and testing.
- (U) Complete subfunctions - initialize TADIL-J link, process intelligence data, receive land platform status, initiate non-vectored engagements, process intelligence data, etc.
- (U) Award Block B hardware production contract.

3. (U) FY 1994 Planned Program:

- (U) Complete subfunctions - link status and network participation data recording and data extraction for JTIDS, software maintenance capabilities simulate and process vector messages, incoming/outgoing handover processing, message filtering, etc.
- (U) Complete Block B MCE P3I software through Version 11.
- (U) Develop JTIDS digital bus and fiber optic interfaces.
- (U) Deliver JTIDS external terminals and shelters.

4. (U) Program to Completion:

- (U) Complete Block C & D P3I R&D and production.
- (U) This is a continuing program.

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Program Element: #0207412F
PE Title: Tactical Air Control
System Improvements

Project Number: N/A
Budget Activity: #4 - Tactical
Programs

- D. (U) WORK PERFORMED BY: The MCE P3I and TACSI production programs are managed by the Electronics Systems Center (ESC), Hanscom AFB, MA. The MCE contractor is Litton Data Systems at Van Nuys, CA. The ARM Decoy production contractor is ITT Corporation at Van Nuys, CA. The AN/TPS-75 production contractor is Westinghouse Corporation at Baltimore, MD. The JTIDS Terminals contractors are Rockwell-Collins of Cedar Rapids, IA and GEC-Marconi Electronic Systems Corp of Totowa, NJ.

- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Due to insufficient funds for both P3I kits and JTIDS terminals, FY93 procurement was reprogrammed. To meet operational suitability within existing budget, the AF will join the USMC contract to purchase JTIDS Module and JTIDS Interface Box.
2. (U) SCHEDULE CHANGES: Block C start slipped to FY95 due to Block B funding cuts and program stretches.
3. (U) COST CHANGES: CTAPS funds moved into PE 27438. Due to software and contract delays, 3080 funds moved from FY94 to FY95.

- F. (U) PROGRAM DOCUMENTATION:

- (U) Rome Air Development Center (RADC) TR-75-320, "Project SEEK SCREEN," July 1976 (S).
- (U) TAF SORD for MCE, February 1992.
- (U) TAF SON 316-80, "Improved Tactical Air Surveillance/Improved Tactical Air Control System", dated Nov 80 (S), amended Jul 83.
- (U) Decision Coordination Paper (DCP) for Modular Control Equipment (MCE), 10 Feb 87 (S).
- (U) Multi-Service Test & Evaluation Master Plan, MCE, 1 Jul 91.
- (U) AF Mission Need Statement for Theater Missile Defense, June 1991.

- G. (U) RELATED ACTIVITIES:

- (U) PE 0206626M, Tactical Air Operations Module (TAOM) is a joint USAF/USMC program. The TAOM/MCE contract is administered by the USMC under a Memorandum of Agreement between the Navy and the AF.
- (U) MCE P3I integrates PE 0604771D and 0604754F, the Joint Tactical Information Distribution System (JTIDS) terminals and provides secure anti-jam VHF radios via PE 0207423F, the Single Channel Ground and Airborne Radio System (SINCGARS).
- (U) PE 0207438F, Theater Battle Management C4I is developing a wing level standard command and control system for the Air Force.
- (U) \$71M of Air National Guard (ANG) FY93 funds will purchase 8 additional MCE production Operations Modules for their final increment.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

- H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands)

(U) Other Procurement (BA 4):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	83,741	127,363	5,782	Cont	TBD
Quantities:					
MCE OMs	14*	8*	0	102	102
MCE P3I AATO	0	70	0	70	70
AN/TPS-75	15*	0	0	Cont	57
JTIDS Terminals	0	30	0	Cont	48
JTIDS Modules	0	30	0	Cont	48

* Includes ANG quantities; the funding line is active AF only.

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Program Element: #0207412F
PE Title: Tactical Air Control
System Improvements

Project Number: N/A
Budget Activity: #4 - Tactical
Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|---|--------|
| 1. (U) Begin P3I in-plant Block B development testing | Mar 92 |
| 2. (U) Block B production decision | Jul 93 |
| 3. (U) ARM Decoy IOC | Aug 93 |
| 4. (U) P3I DT&E | FY95 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207417F
 PE Title: Airborne Warning and Control System

Project: #N/A
 Budget Activity: #4-Tactical Programs

Project Title: Airborne Warning and Control System (AWACS)

POPULAR NAME: E-3 SENTRY

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestone	Block 30/35 MS IIIA Jun		Block 30/35 MS IIIB Jul	RSIP MS III 2Q/FY96
Engineering Milestones		RSIP Final S/W Test Plan May		
T&E Milestones	Block 30/35 IOT&E Done		Start RSIP DT&E Flt Jan	RSIP DT&E IOT&E Done
Contract Milestones	RSIP 8.6dB Performance Demo Done	Block 30/35 Prod Award LRIP Jul		Block 30/35 Prod Award Full Rate 1QFY95
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contracts	163,601	52,705	81,842	Continuing (TBD)
Support Contract	11,975	5,106	5,000	Continuing (TBD)
In-House Support	19,769	4,135	174	Continuing (TBD)
GFE/ Other	6,629	981	50	Continuing (TBD)
Total	201,974	62,927	87,066	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program develops and integrates system improvements which will enable the E-3 AWACS to remain an effective, survivable airborne surveillance system for command and control of tactical forces and for strategic defense of the United States. These improvements include Electronic Support Measures (ESM), central computer memory upgrade, and Joint Tactical Information Distribution System (JTIDS) Class 2H/TADIL J

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Program Element: 0207417F
PE Title: Airborne Warning and
Control System

Project Number: N/A
Budget Activity: 4-Tactical Programs

and NAVSTAR Global Positioning System (GPS) terminal integrations (collectively known as Block 30/35); the Radar System Improvement Program (RSIP); and HAVE QUICK A-Nets. RSIP will restore required E-3 surveillance capability against the evolving threats posed by low radar cross section fighters and cruise missiles, and improve Electronic Counter Counter Measures (ECCM), reliability and maintainability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Block 30/35 Engineering, Manufacturing, and Development (EMD) completed DT&E/IOT&E flight testing; Initial results are very good.
- (U) Block 30/35 Milestone IIIA, Low Rate Initial Production (LRIP), decision was made on 29 Jun 92; Acquisition Decision Memorandum signed by SAF/AQ on 10 Jul 92.
- (U) Block 30/35 Trial Installation effort and organic maintenance support activities began.
- (U) In May 92, the US and NATO signed agreements making RSIP a joint program; a sixth Group B kit was put on the Westinghouse contract.
- (U) RSIP EMD design work was completed and the prototype hardware kit fabrication began on five US kits and one NATO kit; three US kits completed.
- (U) RSIP software coding and test began; initial software demonstration was completed.
- (U) HAVE QUICK A-Nets Lot IV production contract was awarded.

2. (U) FY 1993 Planned Program:

- (U) Block 30/35 trial installation will continue with the fabrication of the Group A and ESM, CC-2E and JTIDS Group B hardware.
- (U) Block 30/35 upgrade of the Facility for Interoperability Testing (FIT) and Mission Simulator #1 will begin.
- (U) Block 30/35 redesign of the Antenna Radio Frequency Processors (ARFPs) to correct the maintainability problems discovered during DT&E/IOT&E will begin.
- (U) Block 30/35 LRIP contracts will be awarded.
- (U) RSIP EMD will complete the remaining two US kits and the one NATO kit.
- (U) HAVE QUICK A-Nets procurement will be completed.

3. (U) FY 1994 Planned Program:

- (U) Block 30/35 Milestone IIIB, Full Rate Production, will occur.
- (U) Block 30/35 trial installation kit into an operational aircraft will begin.
- (U) Block 30/35 upgrade of FIT and Mission Simulator #1 continue.
- (U) Block 30/35 upgrade of the Avionics Integration Support Facility (AISF) to provide an ESM software maintenance capability will be started.
- (U) Block 30/35 ARFPs maintainability improvements will continue and redesign of the ESM Emitter Library File (ELF) to increase its capacity to meet new ORD requirements will start.
- (U) RSIP EMD will continue with completion of DT&E testing, including all reliability verification tests and all environmental qualification tests.
- (U) RSIP will initiate and complete a 12 month, 74 flight DT&E program.
- (U) RSIP IOT&E will begin.
- (U) Development of the RSIP depot maintenance capability will begin. Cost estimate is considered mature due to actual contractor cost data and recent program office estimate in Apr 92.
- (U) Significant ramp-up in In-House Support due to RSIP test activities, FCA/PCA, depot maintenance capability development, and NATO involvement in the RSIP program.

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Program Element: 0207417F
PE Title: Airborne Warning and Control System

Project Number: N/A
Budget Activity: 4-Tactical Programs

4. (U) Program to Completion: This is a continuing program.
- D. (U) WORK PERFORMED BY: The AWACS Integrated Weapon System Office (ESC/AW) at Hanscom AFB, MA manages the overall AWACS program. ESC/AW and the NATO Airborne Early Warning and Control Program Management Agency (NAPMA), Brunssum, Netherlands, jointly manage the ESM and RSIP cooperative development programs. The major contractors are the Boeing Aerospace Company, Seattle, WA (air vehicle and system integration & test); Westinghouse Electric Corporation, Baltimore, MD (radar); IBM, Owego, NY (Data Processor); GEC-Marconi, Little Falls, NJ (JTIDS).
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
1. TECHNICAL CHANGES: None.
 2. SCHEDULE CHANGES: Block 30/35 production completion will stretch from FY 98 to FY99. RSIP EMD completion will stretch from late FY94 to FY96. RSIP production award in FY96.
 3. COST CHANGES: Complete HAVE QUICK A-Nets production in FY93. Block 30/35 FY92 production funding (\$93M) moved to FY93 because kits could not be installed lead-time away. \$2B modification cap in FY92 PB also stretched Block 30/35 and RSIP procurement across SYDP. FY92 RDT&E decreased a net \$0.2M. FY94 funding will fully fund Block 30/35 but stretch its production.
- F. (U) PROGRAM DOCUMENTATION:
- (U) ROC No: ADC/TAC-1-66 (S), 1 Sep 66
 - (U) DCP No. 5, Rev 4, E3-A (AWACS) Program (S), 6 Mar 80
 - (U) Block 30/35 Acquisition Plan 86-AP-019, 14 Nov 85, and J&A 86-J&A-019, 16 Sep 85.
 - (U) USAF-NAPMO Cooperative R&D Agreement for E-3 ESM, 17 Nov 86
 - (U) SORD for E-3 RSIP, TAF(TAC 001-66)-I,II,III-A, 26 Sep 89.
 - (U) RSIP Acquisition Plan 89-AP-014, 7 May 89 and J&A 89-J&A-OA, 7 May 89
 - (U) USAF--NAPMO Cooperative R&D Agreement for E-3 RSIP, 7 May 92.
- G. (U) RELATED ACTIVITIES:
- (U) Program Element #0604771D,(Common JTIDS), funding for the development of the JTIDS Class 2H terminal required for TADIL J.
 - (U) Program Element #0305164F,(Navstar GPS User Equipment), funding for the development of the Global Positioning System (GPS) user equipment.
 - (U) Program Element #0207423F, (Advanced Communications Systems), funding for the development of the HAVE QUICK radios.
 - (U) United Kingdom and France direct commercial E-3 purchases include, and are dependent upon, the USAF-developed E-3 integration of the JTIDS Class 2H/TADIL J terminal and central computer memory upgrade
 - (U) NATO cooperative participation in RSIP. UK and French participation in RSIP is also being discussed
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: 0207417E
 PE Title: Airborne Warning and
Control System

Project Number: N/A
 Budget Activity: 4-Tactical Programs

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands)

1. (U) AIRCRAFT PROCUREMENT: (BA 5, 1100):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	<u>Program</u>
Class V Mod kits	57,423	74,572	4,641	Cont.	TBD
Initial Mod. Spares	6,246	14,689	1,834	Cont.	TBD

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The United States and the North Atlantic Treaty Organization (NATO) are jointly developing and integrating a common ESM package for US and NATO E-3 aircraft. Boeing Aerospace Company, Seattle, Wa is the prime contractor for ESM integration, and UTL Corporation, Dallas, TX, is the major US vendor for the ESM equipment. Total FSD cost is estimated at \$200 million with NATO contributing a 35% share. The US and NATO are also cooperatively developing the E-3 RSIP. The RSIP cooperative agreement was signed on 7 May 92. The United Kingdom, and France have indicated a desire to participate in the RSIP program and other US E-3 improvements. Discussions on participation are continuing and the USAF and OSD/ISA are working to develop a U.S. position.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (Past 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
HAVE QUICK A-Nets IOT&E	Jan 1988	Successful
RSIP BrassBd Flt Testing 1	Feb-Mar 1990	Successful
RSIP BrassBd Flt Testing 2	2Q/FY91	Successful
Block 30/35 DT&E/IOT&E	Sep 1990-Sep 1992	Successful

T&E ACTIVITY (TO COMPLETION)

<u>EventPlanned</u>	<u>Date</u>	<u>Remarks</u>
RSIP DT&E	1Q FY94-3Q FY95	
RSIP IOT&E	4Q FY94-3Q FY95	

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207423F
 PE Title: Advanced Communications
Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2982 Anti-Jam Communications	3,441	471	478	2,591	7,011

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Advanced Communication Systems program develops and procures jam resistant UHF and VHF frequency hopping tactical radios. The HAVE QUICK UHF radios provide the primary Air Force and DOD UHF ECCM voice communications. SINCGARS (Single Channel Ground and Airborne Radio System) provides anti-jam, VHF frequency hopping voice communications and is the primary means of ECCM communications between Air Force, Army, and USMC aircraft and ground units involved in close air support and joint battlefield operations. Research and Development funds in this program element are used to examine appropriate emerging technologies, provide software development support for the HAVE QUICK family of radios and to support the System Program Office.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) PE #0207423F. Anti-Jam Communications:

Research and Development for the SATURN UHF radio will be completed with Fiscal Year 93 funds. (The acronym SATURN stands for Second Generation Anti-Jam Tactical UHF Radio for NATO, and was formerly called the HAVE QUICK IIA radio program.) Research and Development funds for Fiscal Years 94 and beyond are for investigation of improvements in anti-jam performance and other techniques to improve system reliability and maintainability.

(U) FY 1992 Accomplishments:

- (U) Software changes were made to adapt HAVE QUICK IIA to SATURN waveform. SATURN development completed.
- (U) Software support for HAVE QUICK II radios continued.
- (U) Phase I Qualification program for Airborne SINCGARS to be initiated. Phase I consists of installation of the SINCGARS waveform, radio repackaging and bench testing (Airborne SINCGARS Modification Program).

(U) FY 1993 Planned Program:

- (U) Continue software support for the HAVE QUICK II radios.
- (U) Investigate improvements in anti-jam performance and other techniques to improve general system performance.
- (U) Conduct Phase II Qualification Testing for Airborne SINCGARS. Phase II consists of reliability and flight testing (Airborne SINCGARS Modification Program).

(U) FY 1994 Planned Program:

- (U) Continue software support for the HAVE QUICK II radios.
- (U) Investigate improvements in anti-jam performance and other techniques.
- (U) Complete SINCGARS Phase II Qualification Testing.

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Program Element: #0207423F
 PE Title: Advanced Communications
Systems

Budget Activity: #4 - Tactical Programs

(U) Work Performed By: Electronic Systems Center, Hanscom AFB, MA manages the program. There are no Research & Development contractors. Magnavox Electronic Systems Corporation, Ft Wayne, IN has the Firm Fixed Price contract for the AF Airborne SINCGARS radio modification program.

(U) Related Activities:

(U) Army PE #644805, SINCGARS. The Air Force is buying ground SINCGARS radios through the Army. Air Force funds for ground SINCGARS procurement are provided through this Program Element, PE 0207423F.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Aircraft Procurement (Appn 3010, BSA 0505, WSC C13500 C-135, WSC E00300 E-3, WSC OTHACF Other Aircraft)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	9,309	9,887	19,175	3,181	41,830

(U) Other Procurement (Appn 3080; CE 168300004, WSC 838090 Anti-jam voice, and WSC 83790A Initial Spares)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	19,169	6,658	10,062	Cont.	TBD

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207431F

Budget Activity: # - Tactical Programs

PE Title: Tactical Air Intelligence Systems (TAIS)

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>TO</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
XXXX Tactical Air Intelligence Systems	0	0	3,533	Cont	TBD
Total	0	0	3,533	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The tactical forces are faced with a critical deficiency in their capability to rapidly and accurately process and disseminate intelligence information from various sources to operational commands and command and control elements. The purpose of this program is to develop, acquire, and operate land-based processing, analysis, and dissemination systems used by tactically deployed general purpose forces. The program will ensure targeting, imagery, mapping, and threat data are available to support various levels of operations, e.g., peacetime, humanitarian, crisis, and wartime missions. With increasing manpower reductions, automation capabilities will be increasingly necessary to support the anticipated large volume of operational requirements. In this era of automation and high tech weapon systems, the most responsive combatant will win the battle. Lack of these funds would preclude the critical, timely and responsive automated intelligence for the crucial mission planning and execution needed to win. Without this system the aircraft and crew would be needlessly exposed to unknown hostile threats and unfamiliar target areas, therefore putting their lives and the success of the mission at great risk.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) XXXX Tactical Air Intelligence Systems:

The program this funding supports is Sentinel Byte. Sentinel Byte is the Air Force's unit-level intelligence automation for the wing/squadrons. Program applies off-the-shelf technology, commercial/government standards, and application of intelligence software derived for theater production. Present applications include secure wing/squadron telecommunications, threat picture overlays, and office automation software. Program is evolutionary: testbeds-1987/88; phase I deployment (13 sites)-1988/89; phase II to Block II development/deployment-1992/1995. Sentinel Byte's goal is full integration of all unit-level automation systems, and fosters coordination and technology-sharing across the USAF. "Team" includes representatives from all MAJCOMs and Air Staff. Sentinel Byte has four major goals: 1. Provide fused intelligence pictures at Headquarters/Number Air Force levels to unit level to support mission planning. 2. Provide secure intrabase Wing/Squadron telecommunications between intelligence systems (in-garrison USAFE and PACAF only: ACC addressing mobile communications with interface to long haul communication requirement). 3. Integrate the unit-level intelligence picture on one system. 4. Provide automation support to assist unit-level intelligence briefing, etc.

(U) FY 1993 Planned Program:

- (U) Not Applicable

(U) FY 1994 Planned Program:

- (U) Investigate and develop Sentinel Byte's "Electronic Footlocker" concept for:
-- (U) Electronic Documents

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Program Element: #0207431F

Budget Activity: # - Tactical Programs

PE Title: Tactical Air Intelligence Systems (TAIS)

- (U) Digital Maps
- (U) Imagery
- (U) Threat Data
- (U) Analyst Tool
- (U) Investigate new hardware platforms as a replacement to the SunSparc 2 workstation.
- (U) Continue to explore the use of Electro-Optical Devices for storage media. Investigate new storage media.

(U) FY 1992 Accomplishments:

- (U) Not Applicable

(U) Work Performed By: To be determined, pending full and open competition.

(U) Related Activities:

(U) Program Element #64321F, (Tactical Fusion Program)

(U) There is no unnecessary duplication of effort within the Air Force or the DoD.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement (BA 832010):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
(U) Cost	542	209	11,170	55,893	67,814

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207438F

Budget Activity: #4 - Tactical Programs

PE Title: Theater Battle Management C4I (TBM C4I)

A. (U) RESOURCES (\$ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
4287 Contingency Theater Automated Planning System (CTAPS)	0	0	9,177	Cont	50,217
4288 Air Force Wing Command and Control System (AFWCCS)	0	0	3,341	Cont	22,104
Total	0	0	*12,518	Cont	72,321

* Consolidation of AFWCCS and CTAPS funds. CTAPS funds were transferred from PE 0207412F. Prior years not funded with RDT&E dollars.

B. (U) BRIEF DESCRIPTION OF ELEMENT: As a result of the CSAF Command, Control, Communications, Computers and Intelligence (C4I) Review in Sept 92, a new program element is required to consolidate and standardize the Air Force Theater Battle Management (TBM) Command and Control programs. To reflect this consolidation, the title for PE 24738F has been changed to TBM C4I. Beginning FY94, CTAPS funding has been transferred from PE 27412F into PE 27438F. This program will consist of multiple C2 development programs within the CTAPS architecture identified as the Air Force standard for theater command and control. The AFWCCS is the unit level implementation of CTAPS. CTAPS/AFWCCS is designed to open systems standards that allow increased interoperability and compatibility with joint service and allied systems. In addition, this program will use an evolutionary acquisition strategy that will accommodate changes in user requirements and improvements in commercial technology through a series of planned incremental software releases.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 4287, CTAPS:

CTAPS directly supports the Joint Air Component Commander at the force level and enables execution of the air campaign down to the unit level. This standardization will allow greater interoperability between USAF, Services, and Allied command and control systems. The TBM program will continue to transition technological advances into the CTAPS architecture.

(U) FY 1992 Accomplishments:

- (U) Not applicable.

(U) FY 1993 Planned Program:

- (U) Not applicable.

(U) FY 1994 Planned Program:

- (U) Begin development of Battlefield Situation Display (BSD) module for CTAPS.
- (U) Begin development of CTAPS Air Support Operations Center (ASOC) upgrade.
- (U) Begin implementation of force and unit migration strategies.
- (U) Perform P3I of existing software modules.

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Program Element: #0207438F

Budget Activity: #4 - Tactical Programs

PE Title: Theater Battle Management C4I (TBM C4I)

(U) Work Performed by: CTAPS program office tasks to be transferred from Air Combat Command (ACC), Langley AFB VA to Electronic Systems Center (ESC), Hanscom AFB MA by Oct 93. Sierra Nevada is prime contractor for Modular Air Operations Center (MAOC) shelters and Science Applications International Corporation (SAIC) is prime contractor for MAOC software.

(U) Related Activities:

(U) Program Element #0401840F, Air Mobility Command Command and Control Information Processing System (IPS) provides interoperability with airlift elements.

(U) Program Element #0604321F, Tactical Fusion, funds the development of the Intelligence Correlation Module (ICM) and integration with CTAPS.

(U) Program Element #0603617F, C3 Applications, funds the transition of developments in the Science & Technology base (e.g. APS) to upgrade existing C3 warfighting capability.

(U) Program Element #0207431F, Sentinel Byte, provides fused intelligence data input to CTAPS.

(U) Program Element #0208006F, Air Force Mission Support System (AFMSS), provides mission planning interface between unit level and weapon system.

(U) Program Element #0604231N, Navy Tactical Command System - Afloat (NTCS-A).

(U) Program Element #0203740A, Maneuver Control System (MCS).

(U) Program Element #0604719M, Advanced Tactical Air Command Central System (ATACCS).

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Procurement (BA 833040):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	20,763	14,662	30,916	150,642	215,715
Qty	4*	4*	7*	11*/6**	38*/6**

*MAOC

**ASOC

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4288, AFWCCS:

This project includes development of mission critical application software for AFWCCS operating on commercially available hardware and system software. Today, this information is relayed over secure and unsecure telephones, radios, and other communication devices, as well as by runners to update multi-user status displays (greaseboards) or hand written logs. These techniques, which have not changed substantially since World War II, are cumbersome, error prone, may compromise sensitive information, and involve duplication of effort. Disparate efforts have led to the proliferation of stovepipe systems which inherently do not provide interoperability and do not adequately meet the needs of today's air operations.

(U) FY 1992 Accomplishments:

- (U) Not applicable.

(U) FY 1993 Planned Program:

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Program Element: #0207438F

Budget Activity: #4 - Tactical Programs

PE Title: Theater Battle Management C4I (TBM C4I)

- (U) Not applicable.

(U) FY 1994 Planned Program:

- (U) Will complete AFWCCS application software releases 9 and 10 to perform enhanced scheduling and improved Air Task Order processing.
- (U) Will continue system implementation at 6 additional planned AFWCCS locations.
- (U) Begin implementation of force and unit migration strategies.
- (U) Perform P3I of existing software modules.

(U) Work Performed by: The AFWCCS System Program Office, Standard Systems Center, Gunter AFB, AL, is responsible for overall systems development, integration testing, and installation. The prime contractor is SAIC and work is performed at San Diego, CA and Montgomery, AL. Software development is also performed by the 1912th Communications Support Group (CSGP), Langley AFB, VA.

(U) Related Activities: See project 4287, CTAPS

(U) Other Appropriation Funds (\$ in Thousands):

(U) Procurement (BA 837100):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	2,800	1,472	20,635	115,894	142,404
Qty	1	4*	6	35	47

* Limited initial installations at Whiteman AFB, Seymour-Johnson AFB, Barksdale AFB, and Mountain Home AFB

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207590F
 PE Title: SEEK EAGLE

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
4037 SEEK EAGLE Certifications	18,248	22,954	15,171	Cont	TBD
4038 SEEK EAGLE Technology Applications	0	6,022	N/A	N/A	N/A
Total	18,248	28,976	15,171	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Air Force SEEK EAGLE program certifies weapons and other stores for use on operational aircraft. The program completes these certifications through any combination of ground and flight testing, wind tunnel testing, and engineering analysis. The SEEK EAGLE Technology Application efforts develop and insert technologies into the SEEK EAGLE process, significantly reducing certification cost and time.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) 4038. SEEK EAGLE Technology Applications: The purpose of the SEEK EAGLE Technology Application project is to fund insertion of new and emerging technologies into the SEEK EAGLE process, and provide resources for sustainment of a viable Air Force aircraft-store certification capability. Insertion of new and emerging technologies into the process will result in significant savings in cost and time required for completion of aircraft/store certifications. Once these projects are developed for Air Force use, they will be "transported" to the other services as required using OSD funds. This will make the Air Force developed programs compatible with the other services' computers, software, and methods of completing aircraft-stores certification. There is no duplication of any efforts between the Air Force Technology Application Projects and the OSD Central Test and Evaluation Investments Program (CTEIP - PE# 0604940D). OSD will also fund the technology transfer of the Navy managed High Speed Video Project and Army managed Rotary Wing Store Integration to the Air Force for application to the SEEK EAGLE certification process. Implementing each of these projects into the SEEK EAGLE process will save both time and money in the aircraft-store certification process, reducing typical certification times from years to months, and even weeks, with significant related cost savings.

(U) FY 1992 Accomplishments:

- (U) Program not funded.

(U) FY 1993 Planned Program:

- (U) Provide for proof of concept and insertion of maturing technologies into the certification process for projects funded in FY 1990 and FY 1991. These projects include Computerized Physical Fit (CPF), Integrated Stores Separation Ballistics Accuracy/Test Station concept, Aerodynamic Analysis/Computational Fluid Dynamics (AA/CFD), and the SEEK EAGLE Database.

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Program Element: #0207590F
PE Title: SEEK EAGLE

Budget Activity: #4 - Tactical Programs

- (U) Development of an aircraft-store flutter parametric analysis tool and the assessment of Munition Fragmentation Models for use in aircraft-store certification.
- (U) FY 1994 Planned Program:
 - (U) No further activity planned under this project.
- (U) WORK PERFORMED BY: SEEK EAGLE technology application work is a combination of in-house effort at Air Force Development Test Center, Eglin AFB FL and contracted effort performed by Calspan, Tullahoma, TN; Orlando Technologies, Inc., Orlando, FL; General Dynamics, Ft Worth TX; and Science Applications International Corporation, Seattle WA. The Air Force SEEK EAGLE Office at Eglin AFB, FL manages these technology application programs.
- (U) RELATED ACTIVITIES:
 - (U) SEEK EAGLE modernization relates to, and is integrated with, PE 0604940D, Central Test and Evaluation Investment Program.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not Applicable.
- (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207590F
PE Title: SEEK EAGLE

Project Number: 4037
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SEEK EAGLE Certifications	18,248	22,954	15,171	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Air Force has a variety of combat aircraft and a multitude of stores and store types (munitions, missiles, fuel tanks, electronic countermeasures pods, etc.). Aircraft can carry these stores in numerous loading configurations, which are determined by operational scenarios, missions, and tactics. The loading configurations change as operational plans and tactics change, and new aircraft and stores are developed. Before operational use, the Air Force must certify these configurations for safe loading, safe carriage, and safe separation (jettison and normal release), and must verify ballistics accuracy under the user-specified carriage and employment parameters. The Air Force SEEK EAGLE program completes these certifications through any combination of ground and flight testing, wind tunnel testing, and engineering analysis. There are currently over 700 aircraft-store configurations to be certified, with new ones added on a regular basis. Depending on complexity, certifications can take from months to years.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed GBU-24A/B certification on F-16, F-111F and F-4.
- (U) Began AGM-130C certification on F-15E and F-111F.
- (U) Completed AIM-120/LAU-128 certification on the F-15E.
- (U) Completed CBU-87/89, GBU-10/12, AGM-142 and MK-64/65 on the B-52 aircraft.
- (U) Accomplished work on hundreds of other aircraft-stores configurations in addition to the highlighted examples.

2. (U) FY 1993 Planned Program:

- (U) Complete Suppression of Enemy Air Defense (SEAD) on the F-16C/D; continue certification of BLU-109 on F-16A/B/C/D aircraft; continue F-111E/F mixed loads certification.
- (U) Complete AIM-120/LAU-106 and continue AGM-130 certifications on F-15E.
- (U) Complete certification of MK-20, MK-82 AIR, BSU-85/93, and BDU-48 on B-52 aircraft; begin certification work for CBU-87/89/97 and MK-82 on B-1B aircraft.
- (U) Complete F-16 BLK 50 instrumentation.
- (U) Accomplish work on hundreds of other aircraft-stores configurations in addition to the highlighted examples.
- (U) Maintain SEEK EAGLE engineering analysis capability.

3. (U) FY 1994 Planned Program:

- (U) Complete AIM-120 certification on F-16A/B/C/D and SEAD certification on the F-16C/D Block 40.

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Program Element: #0207590F
PE Title: SEEK EAGLE

Project Number: 4037
Budget Activity: #4 - Tactical Programs

- (U) Complete MK-20, MK-84 and CBU-87/89 certification on F-15E.
- (U) Complete AGM-130C certification on F-15E/F-111.
- (U) Continue AGM-88 (HARM) and B-1B/MK-82 LDGP certification flight tests.
- (U) Continue F-111E/F mixed loads flight testing and complete MK-84 certification on F-16A/B/C/D.
- (U) Accomplish work on hundreds of other aircraft-stores configurations in addition to the highlighted examples.
- (U) Complete development of flutter parametric analysis tool for use in aircraft-store certification.

4. (U) Program to Completion:

- (U) This is a continuing program. The engineering analysis and flight test capability supporting the SEEK EAGLE program must be maintained and improved to provide time and cost efficiencies in providing combat capability to the users.
- (U) Through analysis of the performance of the engineering analysis and flight test capabilities to support user requirements, changes and improvements to the SEEK EAGLE process will be identified and implemented.

D. (U) WORK PERFORMED BY: SEEK EAGLE aircraft-store certification work is performed both under contract with prime airframe contractors and through Air Force in-house engineering and test organizations. The AF SEEK EAGLE program is managed by the AF SEEK EAGLE Office at Eglin AFB FL. Two of the prime contractors are General Dynamics, Ft Worth TX in support of the F-16, and McDonnell Douglas, St Louis MO for the F-15E. Much of the work, however, is done in-house at such locations as the AF Development Test Center, Eglin AFB FL; AF Flight Test Center, Edwards AFB CA; Ogden Air Logistics Center (ALC), Hill AFB UT; and AF Fighter Weapons Center, Nellis AFB NV.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Additional flutter flight testing required to accomplish ADF/AIM-120 certification.
2. (U) Schedule Changes: Configuration certifications were canceled or slipped during the past year to meet user requirements. Some examples are: the F-111/BLU-107 flight testing slipped to FY93; the ADF/AIM-120 certification slipped four months due to additional flight testing requirements; and some certifications of the CBU-87/89 on the F-16 were canceled by the using command.
3. (U) Cost Changes: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Numerous certification requests from users such as Air Combat Command, AF Special Operations Center, and the AF Directorate for International Programs (HQ USAF/IAP) for FMS aircraft. The SEEK EAGLE program does not have its own MNS or ORD, however, individual system ORDs contain early SEEK EAGLE requirements.

G. (U) RELATED ACTIVITIES:

- (U) SEEK EAGLE relates to and must be in step with, programs such as B-1B, B-2, B-52, F-15, F-16, F-111, AMRAAM, SFW, and other various munition programs.

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Program Element: #0207590F
 PE Title: SEEK EAGLE

Project Number: 4037
 Budget Activity: #4 - Tactical Programs

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
3020 MISSILE Procurement, BA 42					
AMRAAM, P-1 Line Item #9	0	0	13,788	Cont	TBD
Quantities	0	0	24	Cont	TBD
3080 OTHER Procurement, BA 161 (All Munitions are inert)					
SFW, P-1 Line Item #20	0	0	2000	Cont	TBD
Quantities	0	0	12	Cont	TBD
I-2000, P-1 Line Item N/A	38	0	0	Cont	TBD
Quantities	3	0	0	Cont	TBD
MK-84, P-1 Line Item N/A	0	1352	0	Cont	TBD
Quantities	0	642	0	Cont	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- (U) Each of the SEEK EAGLE Requests from the Air Force operational commands or HQ USAF/IA Y (for FMS customers) has a user need date. Key milestones such as engineering analysis, ground test, flight test, Operational Flight Program (OFP) update, and Technical Order (TO) publication are established for the approximately 725 requested loading configurations, but are too numerous to list.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207601
PE Title: USAF Wargaming and Simulation

Project Number: #1008
Budget Activity: #6 - Defensewide Management and Support

A. (U) RESOURCES (\$ in Thousands)

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
National Air and Spacewarfare Model (NASM)	0	0	11,573	37,735	49,308

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Provides resources to support development and use of operational wargaming for the Air Force for training, education, and military operations. First year of execution is FY94. Program element replaces Program Decision Package T632 and was created by the consolidation of funding from PEs 27597 and 84751. Organizations comprising this PE include: the Warrior Preparation Center, Einsiedlerhof AFS, Germany; the Air Force Wargaming Center, Maxwell AFB, AL; and the Battlestaff Training School (BLUE FLAG), Hurlburt Fld, FL. PE also includes funding to build the National Air and Spacewarfare Model (NASM) to replace the existing Air Force standard Air Warfare Simulation system. NASM is an air combat resolution model to meet the operational needs of the USAF MAJCOMs or the Unified/Specified Command air components for training of Air Component Commanders and their battle staffs. Primary users will be unified command air components, CINCs, JFACCs, and Service components, as supported by BLUE FLAG and WPC for use in joint exercises involving air campaigns.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments: Not Applicable.

2. (U) FY 1993 Planned Program: Not Applicable.

3. (U) FY 1994 Planned Program:

- (U) Initiate and complete initial rapid prototyping of higher risk NASM requirements
- (U) Establish a full NASM program management office
- (U) Complete the Program Start Review and Acquisition Panel
- (U) Complete the A-Specification
- (U) Complete NASM Request For Proposal (RFP)
- (U) Release the Draft NASM RFP for contractor comments
- (U) Release final NASM RFP

4. (U) Program to Completion:

- (U) Award NASM development contract
- (U) Complete final prototyping of NASM
- (U) Perform user training
- (U) Transition operations and management functions to user community
- (U) Incorporate technological developments and evolving requirements
- (U) This will be a continuing program

D. (U) Work Performed By: The Air Force Material Command (AFMC) Electronic Systems Center (ESC), Hanscom AFB MA is the Program Manager for NASM; currently no contractor(s) have been selected to support this effort.

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Program Element: #0207601
 PE Title: USAF Wargaming and Simulation

Project Number: #1008
 Budget Activity: #6 - Defensewide Management and Support

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:

- (U) CSRD TAC-LANGLEY-92-9022,
- (U) Independent Cost Estimate, 1 Oct 92
- (U) Draft NASM System Specification (ESC SPEC. NASM-SS-001), 16 Oct 92
- (U) Draft NASM Statement of Work, 16 Oct 92

G. (U) RELATED ACTIVITIES:

- (U) Aggregate Level Simulation Protocol (ALSP), an Army led program with multi-service participation to develop and field constructive simulation interface protocols, coordinate Service and Joint Agency simulation enhancements, and provide ALSP system level software to support an integrated multi-function training environment for joint and combined exercises. NASM will use ALSP to link with Joint, Service, and DoD agency models for naval, ground, amphibious, space, electronic warfare, and logistics functionality.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
O&M	0	0	11901	Cont	TBD
Procurement	0	0	683	Cont	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

RFP Release	Jun 94
Contract Award	Dec 94
Initial Prototype	Feb 95
System Testing	Jun 97
Initial Operational Capability (IOC)	Sep 97
Final Operating Capability (FOC)	Sep 98
Organic Air Force Maintenance Begins	Feb 99

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208006F
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3857 Conventional Mission Planning and Preparation System (CMPPS)	5,085	1,883	0,000	0,000	6,968
3858 Air Force Mission Support System (AFMSS)	<u>7,298</u>	<u>12,597</u>	<u>24,249</u>	<u>Cont</u>	<u>TBD</u>
Total	12,383	14,480	24,249	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Mission Planning System program was created in 1990 to consolidate ongoing, fragmented mission planning system development efforts by individual weapon system programs. Air Force Mission Support System (AFMSS) is the single squadron-level mission planning system supporting all current/future aircraft and associated weapons; A/OA-10, F-15, F-16, F-22, F-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, TSSAM, JDAM, JSOW, OBEWS, ATARS, B-1, B-2, B-52, KC-10, K/EC/RC-135, C-5, C-17, C-141, MH-47, MH-53, MH-60 and C/AC/EC/MC-130. Wartime sortie rates, sophisticated avionics, first look and/or beyond visual range target destruction, and the ability to defeat complex threat systems require a computer aided mission planning system and digital data input to maximize the combat effectiveness of sophisticated aircraft/weapon systems. Conventional Mission Planning and Preparation System (CMPPS) supports near-term B-52/Tri-Service Standoff Attack Missile (TSSAM) mission planning requirements.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3857. Conventional Mission Planning and Preparation System: The purpose is to enhance CMPPS to support interim mission planning requirements for the B-52 and the TSSAM program. The B-52 is the first test and operational launch aircraft for this weapon. Aircrews cannot plan, program, and launch this standoff weapon without CMPPS.

(U) FY 1992 Accomplishments:

- (U) Disk storage upgrade complete
- (U) CMPPS Tape 2 integration
 - (U) Integration and test of aircraft/weapon modules
 - (U) Modified code
 - (U) Training
- (U) Defensive Data base delivery
 - (U) Incorporates latest enemy threats

(U) FY 1993 Planned Program:

- (U) Tape 2.0 formal integration and IOT&E

(U) FY 1994 Planned Program:

- (U) Not Applicable

(U) Work Performed By: The Mission Planning System's development program is being managed by the Directorate for Mission Planning Systems, Electronic Systems Center, Hanscom AFB, MA. CMPPS contractors are Boeing Military Airplane of Wichita, Kansas and McDonnell Douglas of Omaha, Nebraska.

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Program Element: #0208006E
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

(U) Related Activities:

- (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Not Applicable

(U) International Cooperative Agreements:

- (U) Not Applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208006E
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Air Force Mission Support System (AFMSS)	7,298	12,597	24,249	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: AFMSS is a computer-aided mission planning system used by the pilots in the squadron to support weapon system employment. AFMSS Block A provides an interim capability for fighter aircraft by upgrading the present Mission Support System (MSS) II with increased processing speed, storage capacity and graphics capability. AFMSS Block B is the USAF/USSOCOM common, evolutionary, open architecture system to supporting A/OA-10, F-15, F-16, F-22, F-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, TSSAM, JDAM, JSOW, OBEWS, ATARS, B-1, B-2, B-52, KC-10, K/EC/RC-135, C-5, C-17, C-141, MH-47, MH-53, MH-60 and C/AC/EC/MC-130 operations. AFMSS produces Combat Mission Folders (CMFs) and programs aircraft Data Transfer Devices (DTD). CMFs consisting of maps, charts, flight logs, turn point/target imagery, weapons delivery calculations and radar predictions. DTDs are magnetic transfer media which contain avionics, fire control computer, communication and electronic combat information. DTDs are used to initialize aircraft computers in seconds vice minutes it would take to manually enter mission data. Wartime sortie rates, sophisticated avionics, first look and/or beyond visual range target destruction, and the ability to defeat complex threat systems require a computer aided mission planning system to maximize the combat effectiveness of sophisticated aircraft/weapon systems. AFMSS interfaces with theater, command and joint data bases to provide aircrews with the required operations, intelligence, weather, weapons and electronic combat information to plan combat missions. The success of a combat sortie is jeopardized without AFMSS.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) AFMSS Block A modification completed
 - (U) Integration of new or updated mission planning modules for the F-4, F-15, F-16, F-111, and A-10
- (U) Integration of the F-15 and MH-53J mission planning modules with the AFMSS Block B prototypes
- (U) DT&E/Demonstration of AFMSS Block B capabilities

2. (U) FY 1993 Planned Program:

- (U) AFMSS Block B deliveries start
- (U) AFMSS Block C enhancement
 - (U) AFMSS Block C1.0 and C2.0 software development begins
 - (U) Integrate F15, B-52, B-1B, C-17, C/AC/EC/MC-130 and C-141 modules

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Program Element: #0208006F
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

3. (U) FY 1994 Planned Program:

- (U) The FY 94 RDT&E increase reflects the funding required to meet ACC, AMC and USSOCOM requirements by enhancing the Air Force Mission Support System (AFMSS) Core functions (air refueling, delivery and strike planning) to support all Air Force airlift, bomber, electronic combat, fighter, reconnaissance, rescue, tanker aircraft and USSOCOM aviation assets; continuing development of C2.0 and starting development of C3.0 software release; and integrating additional aircraft/weapons/electronic systems mission planning modules.
- (U) AFMSS Block C1.0 software release
- (U) AFMSS Block C2.0 software development continues
- (U) AFMSS Block C3.0 software development begins
- (U) Begin integration of B-2, F-16, F-111, C-5, C-141, AGM-130, TSSAM and MH-60 mission planning modules
- (U) Enhance AFMSS Core to include air refueling, delivery and strike planning functions

4. (U) Program to Completion:

- (U) This is a continuing program
 - (U) Continue AFMSS hardware and software enhancements to satisfy A/OA-10, F-15, F-16, F-22, F-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, TSSAM, JDAM, JSOW, OBEWS, ATARS, B-1, B-2, B-52, KC-10, K/RC-135, C-5, C-17, C-141, MH-47, MH-53, MH-60 and C/AC/EC/MC-130 requirements
- (U) Complete AFMSS Block B/C hardware deliveries

D. (U) Work Performed By: The Mission Planning System's enhancement program is managed by the Directorate for Mission Planning Systems, Electronic Systems Division, Hanscom AFB, MA. Contractor for the AFMSS projects is Lockheed Sanders of Nashua NH.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES:

- (U) None

2. (U) SCHEDULE CHANGES:

- (U) None

3. (U) COST CHANGES:

- (U) None

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 13-87, SAC Mission Planning Systems, SECRET, Feb 1988
- (U) TAF SON 312-87, TAF Mission Support Systems, May 1988
- (U) MAC SON 07-88, MAC Mission Planning Systems, Jun 1989
- (U) TAF SORD 312-87-III-B, Air Force Mission Support System (AFMSS), Jan 1993

G. (U) Related Activities:

- (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense

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Program Element: #0208006E
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

H. (U) Other Appropriation Funds (\$ in Thousands):

- (U) Other procurement (Budget Activity - Tactical Air Control Systems Improvement/P106):

	FY 92 <u>Actual</u>	FY 93 <u>Estimate</u>	FY 94 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	5,883	25,480	24,479	137,658	193,500
Qty (Ground)	13	101	97	337	548
Qty (Portable)	0	0	1	1208	1209

I. (U) International Cooperative Agreements:

- (U) Not Applicable

J. (U) MILESTONE SCHEDULE:

- | | |
|--|--------|
| 1. (U) AFMSS RFP | Sep 90 |
| 2. (U) AFMSS Block A/B Contract Award | Apr 91 |
| 3. (U) AFMSS Block B Downselect | Dec 92 |
| 4. (U) AFMSS Block C Contract Award | Dec 92 |
| 5. (U) AFMSS Block B Deliveries Begin | Sep 93 |
| 6. (U) AFMSS Block C1.0 Delivers Begin | Jun 94 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208021F Budget Activity: #4 - Tactical Programs

PE Title: Electronic Combat Support

A. (U) RESOURCES (\$ in Thousands)

Project

<u>Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
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374 - C3 PROTECTION/MULTI-MISSION, TECHNOLOGY AND SUPPORT

	2635	2080	2292	Cont	TBD
TOTAL	2635	2080	2292	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program accomplishes studies and develops systems to provide warning, self-protection and support to personnel and equipment against electronic combat systems employed by enemy forces. It identifies existing research and development efforts which can satisfy unfulfilled operational requirements identified by the Unified and Specified (U&S) Commands, and it makes maximum use of current service lab developments to avoid duplication and quickly bridge the gap between technology development and operational requirements. The Secretary of Defense identified the need for this capability in 1983, and in 1986, with unanimous approval of the services and U&S Commands, JCS made the Systems Engineering (SE) function a permanent part of the Joint Electronic Warfare Center (JEWEC) mission. The Air Force, as executive agent, is responsible for the total funding of this essential effort.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 374, C3 PROTECTION/MULTI-MISSION, TECHNOLOGY, & SUPPORT: Develops engineering capabilities to match EW operational programs with quick, off-the-shelf existing technology.

(U) FY 1992 Accomplishments:

- (U) Completed laboratory testing of

System delivered to NAVY/FLTDECGRUPAC in June 1992. Concept of Operations (Conops) now under development by customer.

- (U) Demonstration of Geopositioning Aviator Radio System (GEARS) completed locating, low prob

- (U) Navy Tactical Exploitation of National Capabilities (TENCAP) office

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Program Element: #0208021F

Budget Activity: #4 - Tactical Programs

PE Title: Electronic Combat Support

- (U) JSOC requested a
 - through a: extended frequency
 - Operational testing began in
 - September 1992.
- (U) Prototype testing completed on Army Communications ECM/ECCM Training System (ACETS). Provides effective ECM and ECCM training without actually radiating a signal. Prototype delivered. Consumer testing began in October of 1992.
- (U)
- (U) Testing began in October 1992.
Contract awarded for an
 - to be called the Air Force Electronic Warfare Training System.
- (U) Continued development of a
 - Contract awarded, prototype under construction.
- (U) Feasibility study completed on the
 - Operationally infeasible at this
 - time.
- (U) Developed and field tested a
- (U) Demonstrated
- (U) Established requirements for

(U) FY 1993 Planned Program:

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Program Element: #0208021F
PE Title: Electronic Combat Support

Budget Activity: #4 - Tactical Programs

- (U) Low visibility chaff. Development of a form/fit/function chaff cartridge that provides no visual indication of dispensing by eliminating the conventional pyrotechnic squib reflection and ignition of the chaff dipoles.
- (U) Chaff round redesign.

- (U) Pulse generator.

(U) FY 1994 Planned Program:

- (U) Investigate technologies and develop prototypes to improve electronic support measures (ESM).
- (U) Full scale testing/implementation of UAV EW payloads, with expansion to other payloads likely.
- (U) Develop methods to facilitate processing of new complex threat emissions.
- (U) Develop advanced electronic countermeasures (ECM) against the next generation of threats and possibly against some of our own, if necessary.
- (U) Continue airborne testing of the expendable balloon jamming platform for use with other payloads.

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Program Element: #0208021F

Budget Activity: #4 - Tactical Programs

PE Title: Electronic Combat Support

- (U) Continue to investigate technologies to support contingencies, low intensity conflict, and special operations.
 - (U) Continue to investigate the latest in laser warning.
 - (U) Continue unfinished projects as required.
 - (U) Continue to bridge the gap between the lab and the operator and continue to introduce cutting edge technology to the field and fleet through rapid prototyping of state-of-the-art equipment.
- (U) Work Performed By: The JEWG, at Kelly AFB, Texas, performs independent studies and analysis leading to the development of engineering prototypes for field demonstration/operations. When technology is available in service labs, JEWG arranges for the development of a prototype, and in conjunction with the developer, conducts testing and field demonstration. Some of these laboratories include the Air Force Geophysics Laboratory, Eglin AFB, Florida; the Pacific Missile Test Center, Point Magu, California; and the Naval Ocean System Center, San Diego, California. Where required technologies are not available within DOD, the JEWG manages contractual efforts to produce, test, and demonstrate prototypes. JEWG currently has an engineering support contract with Northrop Defense Systems Division (NDSD), Rolling Meadows, IL. Under JEWG management, NDSD performs engineering analysis, procures, fabricates, tests and demonstrates engineering models to satisfy CINC identified operational shortfalls.
- (U) Related Activities:
- (U) JEWG/SE programs support services and joint electronic combat (EC) programs.
 - (U) JEWG/SE builds upon technologies demonstrated in PE 0604270F, EW Development, and other service's related PE's.
 - (U) Technology development is related to that being developed in the following PE's: PE 0603711A, Aircraft Survivability Equipment; PE 00603718A, Vulnerability Susceptibility; PE 0603755A, Tactical ECM Systems; and PE 0603214N, Tactical C3 Countermeasures.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriations Funds (\$ in Thousands): not applicable.
- (U) International Cooperative Agreements: not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303110F

Project Number: 2638

PE Title: Defense Satellite Communications System (DSCS)

Budget Activity: #5 - Intelligence & Communications

A. (U) RESOURCES (\$ in Thousands):

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Defense Satellite Communications System					
DSCS	13,765	12,856	25,522	1,356,900	1,881,300

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: DSCS provides Super High Frequency (SHF) satellite communications for secure voice and high data rate transmissions. It provides unique and vital national security communications for worldwide military command and control, crisis management, relay of intelligence and early warning data, treaty monitoring and surveillance information, and diplomatic traffic. DSCS supports the National Command Authorities, Worldwide Military Command and Control System, Diplomatic Telecommunications Service, White House Communications Agency, and ground mobile forces of all services. The program procures the Integrated Apogee Boost Subsystem (IABS) which is required in order to launch DSCS on an ATLAS-II booster.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Launched first DSCS III with the IABS on ATLAS-II booster in February 1992.
- (U) Launched second DSCS III with the IABS on ATLAS-II booster in July 1992.
- (U) Began activation of DSCS satellites for launch in FY 1993.
- (U) Incorporated linear solid state amplifiers (SSAs) on DSCS IIIB-10 for Flight #4 in FY 1993 replacing 10-watt traveling wave tube amplifiers (TWTAs).
- (U) Completed facility modifications for DSCS Processing Facility (DPF) at Cape Canaveral, FL.

2. (U) FY 1993 Planned Program:

- (U) Launch two IABS-equipped DSCS III satellites on ATLAS-II.
- (U) Begin activation of DSCS satellite for launch in FY 1994.
- (U) Continue development and implementation of improvements (e.g., higher power SSAs to replace 40-watt TWTAs) and fixes to satellites in storage, prior to launch.

3. (U) FY 1994 Planned Program:

- (U) Launch IABS-equipped DSCS III satellite on ATLAS-II.
- (U) Begin activation of DSCS satellite for launch in FY 1995.
- (U) Continue development and implementation of improvements (e.g., more efficient network controller) and fixes to satellites in storage, prior to launch.
- (U) Initiate software development effort to improve the Generic Telemetry Simulator (GTS) used for launch crew training and launch/on-orbit anomaly resolution. The GTS supports the AFSPACECOM mission for launch operations and on-orbit checkout of DSCS satellites.
- (U) Support MILSATCOM Architecture Planning (Decision Opportunity 2) efforts as directed by the ASD(C3I) MILSATCOM Management Review Group (MMRG).

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Program Element: #0303110F
PE Title: Defense Satellite Communications System (DSCS)

Project Number: 2638
Budget Activity: #5 - Intelligence & Communications

4. (U) Program to Completion:
 - (U) This is a continuing program.
 - (U) Launch IABS-equipped DSCS III satellite on ATLAS-II.
 - (U) Continue development and implementation of improvements (e.g., low noise amplifiers to improve downlink gain) and fixes to satellites in storage.
 - (U) Initiate advanced concepts studies for the DSCS SHF Replenishment program prior to contract award in the first quarter of FY 1997.
 - (U) Complete the GTS software development effort.
 - (U) Continue launch of stored DSCS III satellites using ATLAS-II/IABS thru FY2000.
 - (U) Initiate DSCS SHF Replenishment (DSCS-R) Program in FY 1997.
- D. (U) WORK PERFORMED BY: Air Force Space and Missile Systems Center (SMSC) in Los Angeles, CA is responsible for the DSCS space segment. TRW, Redondo Beach, CA is the prime contractor for the DSCS II satellite. General Electric, Valley Forge, PA is the prime contractor for the DSCS III satellite. The Aerospace Corporation, El Segundo, CA provides systems engineering and integration to the Satellite Communications (SATCOM) Program Office, Los Angeles AFB, CA.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES
 1. (U) TECHNICAL CHANGES: No Change.
 2. (U) SCHEDULE CHANGES: FY 1997 and FY 1998 DSCS launches slipped to FY 2000 based on funding constraints over FYDP. DSCS Replenishment (DSCS-R) program start slipped from FY 1995 to FY 1997 based on funding constraints and requirement to complete a commercial satellite communications (SATCOM) study before a DSCS-R milestone decision.
 3. (U) COST CHANGES: DSCS budget over FYDP realigned to stretchout DSCS III launch program by two years and slip DSCS-R program start by two years. Overall results are funding reductions over the FYDP in the DSCS program, approximately \$0.5 billion. The sustaining engineering policy was revised, whereby the DSCS on-orbit anomaly resolution efforts could be funded in the procurement appropriation rather than the O&M appropriation. These efforts will now be funded in missile procurement (3020) and funding transferred from O&M in FY 1994 and beyond.
- F. (U) PROGRAM DOCUMENTATION:
 - (U) DSCS Acquisition Program Baseline, 11 Jun 89.
 - (U) Mission Need Statement for Follow-On to DSCS validated by Joint Requirements Oversight Committee on 23 Mar 90.
 - (U) AFSPACECOM SON for Follow-On to DSCS, 25 May 90.
- G. (U) RELATED ACTIVITIES:
 - (U) Defense Information Systems Agency (DISA) is the system manager and responsible for system engineering, and operational direction.
 - (U) Program Element #0303142A, DSCS, Army procurement of ground terminals.
 - (U) Program Element #0303605F, Satellite Ground Terminals.
 - (U) Program Element #0303109N, Satellite Communications System.
 - (U) Program Element #0305119F, Space Boosters.
 - (U) There is no unnecessary duplication of effort within AF or DoD.
 - (U) The Joint Potential Designator (JPD) will be determined at the next DSCS milestone decision scheduled for the summer of 1995.

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Program Element: #0303110F

Project Number: 2638

PE Title: Defense Satellite Communications System (DSCS)

Budget Activity: #5 - Intelligence & Communications

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands):

	(U)	Missile Procurement (BA 23)				
		FY 1992	FY 1993	FY 1994	To	Total
		<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost		55,542	25,083	32,440	2,743,900	4,024,665

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

Signed "Memorandum of Understanding (MOU)" between US and United Kingdom on "Shared Use of DSCS Satellites by UK SKYNET Earth Terminals through January 1991", revised 4 January 1990. Similar MOU with Iceland, 26 August 1990.

J. (U) MILESTONE SCHEDULE:

1.	(U)	SHF Replenishment (R&D Satellite) Delivered	1st Qtr FY 2002
2.	(U)	Satellite Launches	
		DSCS III/Atlas II FLT 3-4	FY 1993
		FLT 5	FY 1994
		FLT 6	FY 1995
		FLT 7	FY 1996
		FLT 8	FY 1997
		FLT 9-10	FY 2000
		SHF Replenishment FLT 1	3rd Qtr FY 2002
3.	(U)	MILSATCOM Architecture Decision Opportunity 2	June 1994
		DSCS-R DAB/AFSARC	4th Qtr FY 1995
		DSCS-R Program Start	1st Qtr FY 1997

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303131F

Budget Activity: # 3 - Strategic Programs

PE Title: Minimum Essential Emergency
Communications Network (MEECN)

A. (U) RESOURCES (\$ In Thousands):

<u>Project # & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>TO COMPLETE</u>	<u>TOTAL PROGRAM</u>
2834 Ground Wave Emergency Network (GWEN)/Dual Frequency MEECN Receiver (DFMR)	7,283	846	495	Cont	TBD
2832 Very Low Frequency/Low Frequency (VLF/LF) Improvements	<u>12,655</u>	<u>12,129</u>	<u>35,139</u>	<u>Cont</u>	<u>TBD</u>
Total	19,938	12,975	35,634	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element is the Air Force portion of a continuing program supporting the Chairman, Joint Chiefs of Staff (JCS), who is responsible for delivering the National Command Authority's (NCA) decision to execute or terminate actions of our nuclear capable forces in a precise and timely manner. MEECN consists of communications systems specifically designed to provide assured communications connectivity in a stressed environment. MEECN includes the Ground Wave Emergency Network (GWEN), the Dual Frequency MEECN Receiver (DFMR), the High Power Transmit Set (HPTS), and the Advanced VLF Receiver (AVR) Programs. GWEN provides an end-to-end electromagnetic pulse-protected strategic communications capability linking the NCA with early warning centers and with CONUS strategic forces. DFMR will provide a protected strategic communications link to missile (Minuteman III) launch control centers and bomber dispersal bases for receipt of Emergency Action Messages on both GWEN and JCS VLF/LF frequencies. HPTS is a joint Air Force/Navy program to provide the E-4 NEACP and the E-6 TACAMO aircraft with an improved EAM transmission capability. AVR (previously funded under PE #64240F, B-2) is a next generation VLF/LF receiver compatible with the high data rate (HIDAR) transmission mode now required by JCS for all new VLF/LF receivers. The HIDAR effort will develop and test modifications required for the new JCS-directed communications mode.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994 :

1. (U) Project 2834. GWEN/DFMR:

The GWEN/DFMR project defines, develops, tests, and deploys a proliferated ground wave communications system for assured connectivity between the National Command Authority (NCA), early warning sites, command centers, and the combat forces despite ionospheric disturbances caused by high altitude nuclear detonations and provides a receiver capable of operating simultaneously on the JCS VLF/LF and GWEN frequencies. The GWEN Thin Line Connectivity Capability is the initial network. The Relay Node Network Expansion (RNNE) effort will proliferate the relay node sites for reliability and survivability. Originally planned for completion in Jan 1991, Congress delayed further relay node construction until an independent report on GWEN health effects could be completed. That report, by the National Academy of Science, was released in Dec 1992 and it supports completion of the planned network. Approximately 15 months will be required to complete the remaining RNNE sites after construction is resumed.

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Program Element: #0303131F
PE Title: Minimum Essential Emergency
Communications Network (MEECN)

Budget Activity: # 3 - Strategic Programs

(U) FY 1992 Accomplishments:

- (U) Completed portable DFMR Critical Design Review (CDR)
- (U) Completed DFMR support equipment CDR
- (U) Completed DFMR software Formal Qualification Tests (FQT)
- (U) DFMR DT&E started
- (U) Completed/installed GWEN integrated support facility at SM-ALC
- (U) Completed GWEN environmental assessments on all but 2 sites
- (U) Completed GWEN software upgrades to maintenance notification facility
- (U) Completed preparations for construction of GWEN network expansion sites

(U) FY 1993 Planned Program:

- (U) Complete DFMR nuclear shock hardened qualifications for DFMR in LCC's
- (U) Complete DFMR DT&E
- (U) Complete DFMR FCA and PCA for all configurations
- (U) Production decision for DFMR program
- (U) Complete remaining GWEN environmental assessments
- (U) Complete GWEN land acquisitions
- (U) Construct/check-out remaining GWEN network sites
- (U) Site turnover as built

(U) FY 1994 Planned Program:

- (U) Complete residual DFMR EMD tasks
- (U) Turn over final GWEN sites to user

(U) Work Performed By: Air Force Materiel Command, Electronic Systems Center has managerial responsibility for Air Force MEECN programs. The prime contractor for GWEN is GTE Federal Systems, Chantilly, VA. The prime contractor for DFMR is Westinghouse Electric, Baltimore, MD.

(U) Related Activities:

- (U) Program Element 11213F, (Minuteman Squadrons)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

Procurement, PE 11213 (BA 14)

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	TO <u>COMPLETE</u>	TOTAL <u>PROGRAM</u>
Cost	3,900	23,300	32,800	30,000	90,000

(U) International Cooperative Agreements:

Not Applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303131E

Budget Activity: # 3 - Strategic Programs

PE Title: Minimum Essential Emergency
Communications Network (MEECN)

A. (U) RESOURCES (\$ In Thousands):

<u>Project # &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>TO</u> <u>COMPLETE</u>	<u>TOTAL</u> <u>PROGRAM</u>
2832 Very Low Frequency/Low Frequency (VLF/LF) Improvements	12,655	12,129	35,139	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: HPTS is a joint Air Force/Navy program to provide the E-4 NEACP and the E-6 TACAMO aircraft with an improved EAM transmission capability. AVR (previously funded under PE #64240F, B-2) is a next generation VLF/LF receiver compatible with the high data rate (HIDAR) transmission mode now required by JCS for all new VLF/LF receivers. The HIDAR effort will develop and test modifications required for the new JCS-directed communications mode.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed MRT Field Reliability Growth Test
- (U) Initiated delivery and installation of B-1B MRT production assets
- (U) Completed MRT Program Management Responsibility Transfer (PMRT) to WR-ALC
- (U) Completed HPTS Single Trailing Wire Antenna Study
- (U) Began E-4B HPTS DT&E (modification of Navy E-6 HPTS design)
- (U) Completed HPTS Reliability Demonstration Test

2. (U) FY 1993 Planned Program:

- (U) Complete E-4B HPTS Preliminary Design Review, and continue EMD
- (U) Complete HIDAR RFP
- (U) Rebaseline AVR to include E-4B and E-6A aircraft

3. (U) FY 1994 Planned Program:

- (U) Complete restructure of AVR contract to include E-4B and E-6A aircraft
- (U) Complete AVR HW/SW design, integration, and system performance testing
- (U) Complete DT&E for E-4B HPTS with CDR and delivery of final drawings
- (U) Release RFP and award HIDAR development contract

4. (U) Program to Completion:

- (U) This is a continuing program

D. (U) Work Performed By: Air Force Materiel Command, Electronic Systems Center has managerial responsibility for Air Force MEECN programs. Primary responsibility for the joint-service HPTS program is with the Navy's Naval Airborne Strategic Communications Program Office, PMA-271, Arlington, VA. The prime contractor for HPTS, MRT, and AVR is Rockwell International, Richardson, TX.

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Program Element: #0303131E
PE Title: Minimum Essential Emergency
Communications Network (MEECN)

Budget Activity: # 3 - Strategic Programs

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The AVR EMD program was originally designed for the B-2. In Dec 91, as a result of the B-2 Executability/Affordability examination, the program was transferred to the MEECN program. The effort was downscoped to minimize expenses and to capture the technology for other MEECN airborne platforms and provide two laboratory tested engineering development units by the end of FY 93. The program will develop AVR for the E-4B, E-6A, and a derivative of AVR for submarine use.
2. (U) SCHEDULE CHANGES: The AVR EMD effort for the B-2 was originally scheduled for completion in Aug 94. The program has been restructured to include the E-4B and E-6A platforms. This restructure will place EMD completion at Mar 97.
3. (U) COST CHANGES: The restructured AVR EMD effort is estimated at \$111.7M, of which \$28.7M has already been spent. This includes: EMD completion, installation and integration efforts for one E-4B aircraft. Installation and integration efforts for the E-6A aircraft are funded by the Navy.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC ROC 7-71, 22 Apr 71.
- (U) MROC 2-80, 3 Feb 83.
- (U) MROC 18-83, 31 Aug 83.
- (U) OSD Rpt, Strategic Command, Control, and Communications Review Report, 1 Aug 91.
- (U) JCSM-156-91, Minimum Essential Emergency Communications Network Modes, 30 Aug 91.

G. (U) RELATED ACTIVITIES:

- (U) Program Element #32015F, E-4 Modifications
- (U) HPTS is a joint service program with the Navy as lead. The program is governed by a joint MOA maintained at the Secretary of the Air Force/Navy level.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands):

- (U) Aircraft Procurement, PE 32015F (BA 5) : Class V Mods

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	0	0	13,581	42,019	55,600

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

None

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Program Element: #0303131F
PE Title: Minimum Essential Emergency
Communications Network (MEECN)

Budget Activity: # 3 - Strategic Programs

J. (U) MILESTONE SCHEDULE:

HPTS

- | | |
|---|--------|
| 1. (U) DT&E Start (E-6 and EC-135) | Apr 87 |
| 2. (U) Critical Design Review (E-6) | Jun 88 |
| 3. (U) E-4B EMD Contract Start (Mod E-6 Design) | Aug 92 |
| 4. (U) E-4B Preliminary Design Review | Feb 93 |
| 5. (U) E-4B Critical Design Review | Jan 94 |
| 6. (U) E-4B EMD Complete (Drawings Delivered) | Feb 94 |

AVR

- | | |
|---|--------|
| 1. (U) Critical Design Review | Sep 92 |
| 2. (U) Restructured Program on Contract | Mar 94 |
| 3. (U) Complete AVR EMD | Mar 97 |

HIDAR

- | | |
|---------------------------------------|--------|
| 1. (U) RFP Preparation | Mar 93 |
| 2. (U) RFP Release | Oct 93 |
| 3. (U) Development Contract Award | Jan 94 |
| 4. (U) Phase I Prototyping begins | Jan 95 |
| 5. (U) Phase I CDR | Jun 95 |
| 6. (U) Phase II Prototyping begins | Jun 95 |
| 7. (U) Phase II CDR | Dec 95 |
| 8. (U) Phase I Prototyping complete | Mar 96 |
| 9. (U) Phase I testing begins | Apr 96 |
| 10. (U) Phase II Prototyping complete | Jun 96 |
| 11. (U) Phase I testing completes | Jul 96 |
| 12. (U) Phase II testing begins | Jul 96 |
| 13. (U) Phase II testing completes | Sep 96 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140F

Project Number: 7820

PE Title: Information Systems Security (INFOSEC)

Budget Activity: # 5 Intelligence & Comm

A. (U) RESOURCES (\$ in Thousands)

<u>Project Title</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>To</u>	<u>Total</u>
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
7820, Communications-computer security (C-CS) RDT&E: FIRESTARTER	10,942	13,424	15,418	Cont:	TBD

* FY 92 and 93 funding contained in PE 0303-01F, Communications Security

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element (PE) addresses problems encountered in adapting general purpose cryptographic equipment for use in new Air Force communications and computer systems. The Air Force does not have mechanisms that allow the implementation of tamper proof guarantees against professional and amateur intruders within the systems. This program also develops secure voice systems, communications security (COMSEC) devices, and systems that prevent unintentional emanations (TEMPEST technology). All initiatives are part of the Department of Defense (DoD) INFOSEC program and insure that Air Force Systems being developed meet current national communications security requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Fabricated feasibility prototype of the Non Stop Receiver for next generation TEMPEST testing.
- (U) Installed the prototype of the Security Surveillance Toolkit at STRATCOM
- (U) Installed the Haystack auditing system at Air Mobility Command ACM to process auditing and intrusion detection.
- (U) Developed and installed a security guard at Air Mobility Command (AMC) to provide secure data transmission between the Top Secret WWMCCS and the Secret Crisis Action Team (CAT) facility.
- (U) Demonstrated a prototype of a secure distributed computing environment which integrates several different types of computers into a single system.
- (U) Demonstrated improved secure voice capability the development of a Sinusoidal Transform Coder operating at 2.4 KB.
- (U) Developed and demonstrated a prototype of a secure database management system for the AF standard small computer.

2. (U) FY 1993 Planned Program:

- (U) During FY93 the development of the Non Stop Receiver will be completed and several engineering models will be fielded.

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Program Element: #0303140F

Project Number: 7820

PE Title: Information Systems Security (INFOSEC)

Budget Activity: # 5 Intelligence & Comm

- (U) A prototype of the CYPRIS high speed encrypting system will be demonstrated within the SPEAKEASY Programable Radio.
- (U) The Seaview secure relational database system capable of the A1 level of assurance will be demonstrated.
- (U) A security guard based upon the WWMCCS-CAT guard will be developed and installed at CENTCOM, and become operational at AMC.
- (U) A prototype of Intrusion Detection System (IDS) to monitor networked and distributed computing systems will be demonstrated.

3. (U) FY 1994 Planned Program :

- (U) An operational evaluation version of the secure distributed computing system for ESC, and joint Army/Navy/Air Force evaluation will continue through 1994.
- (U) Secure multi speaker conference will be demonstrated, and improved secure voice quality will be available through the use of adaptive bit coding.
- (U) A secure database management system based upon the use of logical co-processors will be available in prototype form.

4. (U) To Completion :

- (U) This project provides a continual flow of products from the development environment to the operational user, and is the only project of its type to address this spectrum of activities.

D. (U) Work Performed By: There are multiple contractors working on technology development efforts within this PE, all managed through the Rome Laboratory, Griffis AFB, NY and Electronic Systems Division (ESC) in Bedford MA. The top five are Harris Corp, Melbourne, FL; Watkins Johnson Corp, Gathersburg, MD; Odessey Research Associates, Ithica, NY; Arcon Corp, Waltham, MA; Summaris Corp, Waltham, MA. There are an additional 15 contractors working on various parts of the program.

E. (U) COMPARISON WITH FY93 AMENDED PRESIDENT'S BUDGET (\$ in Thousands):

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: A one year delay in electromagnetic remanence detection development, and a two year delays in the in the NONSTOP receiver and enhanced baseband processor TEMPEST development efforts occurred due to the redirection of funds from this program element to higher Air Force priorities.
3. (U) COST CHANGES: The schedule changes are not expected to result in additional development costs to the Air Force.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 738-88C1, Multilevel Security for C3I Systems (U)
- (U) ESC SON 013-89C1, COMFY ASH (S-NF-W).
- (U) SAC SON 000-89C1, Secure Database System (S-NF-W).
- (U) SAC SON 000-89C1, Secure Management of Aggregation of Data (S-NF-W).

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Program Element: #0303140F
PE Title: Information Systems Security (INFOSEC)

Project Number: 7820
Budget Activity: # 5 Intelligence & Comm

- (U) SAC SON 000-89C1, Classified Material Control System (S-NF-W).
- (U) AFMPC SON 000-089C1, Personnel Records Security System (S-NF-W).
- (U) ESC SON 008-89C1, Advanced NONSTOP Test Set (S-NF-W).
- (U) ESC SON 012-89C1, Computer Assisted Signal Analysis Technology Program (S-NF-W).
- (U) ESC SON 009-89C1, Broadband Time Domain Signal Collection System (S-NF-W).
- (U) ESC SON 011-89C1, Wideband Recorder/Player (S-NF-W).
- (U) ESC SON 010-89C1, SHF/EHF Test System (S-NF-W).
- (U) AFSPACECOM (pending), Handheld Secure Radios (U).
- (U) AFWL (pending), High Speed Key Generation Devices (U).
- (U) ESC SON 002-90, Acoustic Energy Retrieval/Measurement System (S-NF-W).
- (U) AFSPACECOM SON 000-90, Secure Hand-Held Cellular Telephone (S-NF-W).
- (U) ESC SON 001-90, Advanced Demodulator (S-NF-W).
- (U) AFSC SON 000-89, High-Speed Crypto Generator (S-NF-W).
- (U) AFLC SON 002-90, Network Security System (NSS) (U).
- (U) ESC SORD 838-88-I, MLS for MAC Command and Control Automated Systems, MLS information Flow Control Subsystem for AFLC Automated Information Systems, and MLS for ESC Intelligence Data Handling Systems (U).
- (U) ESC SORD 000-00-I, MLS for TAF Unit Level Theater Battle Management System and MLS for the Air Force Flight Test Center (AFFTC) (U).

G. (U) RELATED ACTIVITIES:

- (U) The research and development efforts pursued under PE 33140F are complementary to work being performed under NSA PE 35167G which is addressing the development of generic technology in the area of Information Security.
- (U) PE 33140F is related to the development of formal methods as part of the SDI program under PE 63215C.
- (U) Products from PE transition to other agencies thru PE 64740F Computer Resource Management Technology.
- (U) There is no unnecessary duplication of effort within the Air Force of the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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Program Element: #0303140F

Project Number: 7820

PE Title: Information Systems Security (INFOSEC)

Budget Activity: # 5 Intelligence & Comm

Additional Information - Not For Publication

(U) 7820, COMMUNICATIONS-COMPUTER SECURITY (C-CS) RDT&E:

A. (U) Project Description: The ability to provide adequate safeguards for classified data throughout all portions of an information handling system is fundamental to the effective mission execution for all present and future Air Force systems. This project develops the necessary technology mechanisms and system methodologies necessary to secure, evaluate, and monitor the security of an operational environment. It is the only Air Force PE which is addressing the ability to provide simultaneous, controlled access, processing and dissemination of data at multiple levels of classification by users with differing clearance levels and needs to know. It attacks the problems in four domains: Communications Security (COMSEC); Computer Security (COMPUSEC); Emanations Security (TEMPEST); and Secure Voice. It focuses on operational problems identified by the MAJCOMS as part of the FIRESTARTER process. Where near term solutions are within the state of the art, the emphasis is on technology. In those cases where the current technology will not support the required capability, the necessary development is undertaken and evaluation prototypes are configured for evaluation prior to transition.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0303144F

Project Number: 0001

PE Title: Electromagnetic Compatibility Analysis Center (ECAC)

Budget Activity: #5 - Intelligence & Communications

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Electromagnetic Compatibility Analysis Center (ECAC)					
Total	10,029	9,733	10,015	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: ECAC is a Joint DOD Center operating IAW with DOD Directive 3222.3. Policy and program direction are provided jointly by the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C3I) and the Chairman, Joint Chiefs of Staff (JCS). The Air Force is designated as the administrative agent for ECAC with the responsibility to program, budget, and finance the Joint Program. The Air Force provides both RDT&E and O&M funds under Program Element 0303144F. The Center is responsible for providing electromagnetic compatibility (EMC) support to ASD, JCS, and the military departments. ASD/JCS directed projects for which the Center is responsible include the Frequency Resource Record System (FRRS), Joint Spectrum Management System (JSMS), EMC Analytical Model Development, Operational Planning, and Electromagnetic Dependent Systems Acquisition EMC Guidance. The ECAC developed and maintained FRRS and JSMS are managed by JCS and required by frequency management components of the Services and Commanders in Chief (CINCs) to guarantee optimum use of the spectrum throughout the world during peacetime and contingency operations. The EMC Analytical Model Development project provides EMC analysis tools used to accomplish Systems Acquisition Support and are made available for use throughout the DOD. ECAC Operational Planning support provides Service, JCS, and CINC planners with unclassified information describing the infrastructure for countries and regions where U.S. troops may be deployed. The ECAC provides support to the U.S. Military Communications-Electronics Board (MCEB) in developing guidance to the Air Force and other Service systems acquisition managers with regard to frequency supportability and EMC during development, procurement, and deployment of systems. ECAC responsibilities also include direct support to the Air Force and other Services in designing, developing, and acquiring equipment supporting C3I and electronic warfare (EW), that will operate compatibly and reliably with other systems in strategic or tactical operations. Failure to develop electromagnetically compatible C-E systems will result in operational degradation, leading to loss of aircraft or electronic weapon system malfunction. The ECAC provides the technical data and analytical models used in the analysis of over 200 DOD programs. To assure the compatible operation of systems in their intended operational environment, the ECAC provides support to system acquisition program management offices, operational commanders, and frequency managers on a cost reimbursement basis.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed two additional FRRS connections to DISNET-1.
- (U) Managed/maintained/operated the DOD EMC Data Base.
- (U) Developed approaches for estimating EMI effects of high power microwave devices.
- (U) Developed EMC analysis techniques for transmit/receive modules.

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Program Element: 0303144F

Project Number: 0001

PE Title: Electromagnetic Compatibility Analysis Center (ECAC)

Budget Activity: #5 - Intelligence & Communications

- (U) Interfaced FRRS with host government data bases.
- (U) Developed techniques to determine antenna-to-antenna EMI coupling over composite material aircraft surfaces.
- (U) Reviewed and provided EMC evaluations to the MCEB on Service systems under development.
- (U) Completed IOC Joint Spectrum Management System.
- (U) Exercised two-year option on contract for ECAC.

2. (U) FY 1993 Planned Program:

- (U) Participate in the modeling of the DOD Spectrum Management function.
- (U) Develop initial architectural plan for the next generation spectrum management system.
- (U) Distribute IOC Joint Spectrum Management System and continue development of full capability.
- (U) Manage/maintain/operate the DOD EMC Data Base.
- (U) Review and provide EMC evaluations to the MCEB on Service systems under development.
- (U) Develop techniques for predicting interference effects on terrain-following radars.
- (U) Assess the susceptibility of selected Electro-Optic (E-O) sensors to EMI.
- (U) Begin development of an automated capability to assess the effects of interference to entire communications networks.

3. (U) FY 1994 Planned Program:

- (U) Develop migration strategy/plan to move from the present system to the future spectrum management system.
- (U) Manage/maintain/operate the DOD EMC Data Base.
- (U) Review and provide EMC evaluations to the MCEB on Service systems under development.
- (U) Complete development of Joint Spectrum Management System and begin distribution.
- (U) Develop methodology to predict the effects of EMI on radar ECCM functions.
- (U) Develop techniques to estimate the effects of out-of-band EMI to adaptive phased array antennas.
- (U) Complete development of automated capability to assess the effects of interference on entire communications networks.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: The IIT Research Institute at Annapolis, MD, under contract through the Electronic Systems Center (ESC), Air Force Materiel Command (AFMC). Contractual effort is managed by ECAC technical staff.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

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Program Element: 0303144F

Project Number: 0001

PE Title: Electromagnetic Compatibility Analysis Center (ECAC)

Budget Activity: #5 - Intelligence & Communications

F. (U) PROGRAM DOCUMENTATION:

- (U) DOD Directive 3222.3, dated 20 Aug 90, designates Air Force as the administrative agent and directs that all reprogramming to ECAC's PE funds require ASD/C3I and JCS coordination.
- (U) MCEB Memo MCEB-M-0155/91, dated 20 Sep 91, tasked ECAC to develop the Joint Spectrum Management System.

G. (U) RELATED ACTIVITIES: ECAC supports JCS, DOD, and other Service requirements. ECAC EMC capabilities complement efforts and activities within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Operations and Maintenance/Appn 30:

FY 1992	FY 1993	FY 1994	To	Total
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
6,752	6,090	6,999	Cont	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | | |
|---------|--|-----------------|
| 1. (U) | Achieve IOC Joint Spectrum Management System (completed). | Oct 1992 |
| 2. (U) | Measure the EMI susceptibility levels of selected Electro-Optic (E-O) sensors. | 3rd Qtr FY 1993 |
| 3. (U) | Develop techniques for predicting EMI effects on terrain-following radars. | 4th Qtr FY 1993 |
| 4. (U) | Review and provide EMC evaluations to the MCEB on Service systems under development. | 4th Qtr FY 1993 |
| 5. (U) | Initiate action for follow-on contract for ECAC Engineering Support Services. | 4th Qtr FY 1993 |
| 6. (U) | Develop initial architectural plan for the next generation spectrum management system. | 4th Qtr FY 1993 |
| 7. (U) | Participate in the modeling of the DOD Spectrum Management function. | 4th Qtr FY 1993 |
| 8. (U) | Complete full development of Joint Spectrum Management System. | 3rd Qtr FY 1994 |
| 9. (U) | Develop methodology to predict the effects of EMI on radar ECCM functions. | 4th Qtr FY 1994 |
| 10. (U) | Develop techniques to estimate the effects of out-of-band EMI to adaptive phased array antennas. | 4th Qtr FY 1994 |
| 11. (U) | Review and provide EMC evaluations to the MCEB on Service systems under development. | 4th Qtr FY 1994 |
| 12. (U) | Develop automated capability to assess the effects of EMI to communications networks. | 4th Qtr FY 1994 |
| 13. (U) | Develop migration strategy/plan for next generation Spectrum Management System. | 4th Qtr FY 1994 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303601F

Project: #2487

PE Title: Milstar Satellite Communications System

Budget Activity: #3-Strategic Programs

Project Title: Milstar Satellite Communications System

PHOTOGRAPH NOT AVAILABLE

POPULAR NAME: Milstar

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones		Milstar (M*) DAB, Oct 92; M* DFS 1 Inch:		M* MS III 4 Qtr FY99
Engineering Milestones	M* Sat 1 Thermal Vac Apr 92	M* Sat 1 Delv Feb 93	M* Sat 2 Delv Store Sat 3 Mar 94	Continue Satellite Delivery
T&E Milestones	M* CP Term Ops Assmt Sep 92		IOT&E I (Term) Feb 94	M* IOT&E II (Msn Contrl) May 95; M* IOT&E III (Sys w/MDR) 3 Qtr 00
Contract Milestones	M* Low Cost Term Award Jan 92	M* MDR Dev Oct 92; CP LRIP Buyout Apr 93	M* Sat 4 Fab Oct 93	M* Sat 3 Mod w/MDR Oct 94; M* Sats 5-7 1 Qtr 97; Sats 8-11, 1 Qtr 01
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	913.331	973.667	852.062	10,250.379
Support Contract	57.800	73.500	51.800	528.400
In House Support	15.400	27.300	15.100	133.300
GFE/Other	55.900	64.100	54.200	513.000
Total	1,042.431*	1,138.567	973.162	11,425.079

* Includes PE 0303603F

- B. (U) **BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:** Milstar is a joint service program to develop and acquire Extremely High Frequency (EHF) satellites, satellite mission control segment, and new or modified communication terminals for survivable, jam-resistant, worldwide, secure communications for the strategic and tactical warfighter up through the early stages of nuclear war.

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Program Element: #0303601E
PE Title: Milstar Satellite Communications System

Project: #2487
Budget Activity: #3-Strategic Programs

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Began Sat 1 launch support preparation.
- (U) Began Sat 2 integration.
- (U) Continued development/fabrication of Sat 3.
- (U) Completed development of the Milstar Mobile Constellation Control Station (MMCCS).
- (U) Completed Medium Data Rate (MDR) architecture study System Design Review.
- (U) Continued EDM Command Post (CP) terminal installation.
- (U) Awarded Low Cost Terminal (LCT) Phase I Terminal Processing Unit and risk reduction efforts.

2. (U) FY 1993 Planned Program:

- (U) Deliver and launch Sat 1.
- (U) Complete integration and begin testing of Sat 2.
- (U) Phasedown Sat 3 bus and payload.
- (U) Release MDR Engineering and Manufacturing Development (EMD) contract for Sat 4 with Low Data Rate (LDR) and MDR payloads.
- (U) Continue installing Engineering Development Model (EDM) Satellite Mission Control Subsystem (SMCS).
- (U) Complete EDM Core terminal installation into select ground sites.
- (U) Continue modifications, upgrades, and software maintenance for Command Post terminals.
- (U) Complete Phase I of the LCT program.
- (U) Continue concept exploration for the Milstar Polar Adjunct.

3. (U) FY 1994 Planned Program:

- (U) Deliver and launch Sat 2.
- (U) Store Sat 3 bus and payload in preparation of MDR modification.
- (U) Continue EMD of the MDR payload; complete CDR.
- (U) Continue modifications, upgrades, and software maintenance for Command Post terminals.
- (U) Restructure the LCT program to study and develop technologies for small airborne Milstar terminals.
- (U) Begin EMD of the Milstar Polar Adjunct.

4. (U) Program to Completion:

- (U) Complete EMD of the MDR payload.
- (U) Complete fabrication, integration, and test of Sat 4; and deliver Sat 4.
- (U) Modify and deliver Sat 3 with an MDR payload.
- (U) Fabricate, integrate, test, and deliver Sat 5-7.
- (U) Continue modifications, upgrades, and software maintenance for Command Post terminals.
- (U) Continue development of technologies for small airborne Milstar terminals.
- (U) Develop and field the Milstar Polar Adjunct.

D. (U) Work Performed By:

Development of the Milstar space, mission control, and AF terminal segments is managed by a program office located at AF Materiel Command's Space and Missile Systems Center Los Angeles AFB, CA under the direction of the AF Program Executive Officer (PEO) for Space. Milstar satellites and SMCS are developed by Lockheed Missiles & Space Co., Sunnyvale, CA. Milstar terminals are developed by Raytheon Company, Sudbury, MA and Rockwell International, Dallas, TX. Systems Engineering and technical support is provided by the Aerospace Corporation, El Segundo, CA; MITRE Corporation, Bedford, MA; and Lincoln Laboratory, Bedford, MA.

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Program Element: #0303601F
PE Title: Milstar Satellite Communications System

Project: #2487
Budget Activity: #3-Strategic Programs

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: (Milstar) Satellite 3 will be modified with an MDR payload. LCT EMD will be canceled after completion of Phase I in FY93.
2. (U) SCHEDULE CHANGES: Award of the MDR development contract slipped from Jun 92 to Oct 92 due to slips in the DAB review; the DAB was successfully completed in Oct 92. Command Post Terminal buyout contract slipped from Mar 92 to Apr 93, for completion of an operational assessment and reliability qualification testing. Modified satellite 3 launch now planned to follow satellite 2. Technical problems resulted in the delayed Milstar launch.
3. (U) COST CHANGES: FYDP reduction from 1) program restructure which reduced schedule risk by eliminating MDR development/fabrication concurrency, and 2) the LCT EMD cancellation.

F. (U) PROGRAM DOCUMENTATION:

- (U) Milstar Operational Requirements Document (ORD), 4 Sep 92.
- (U) Milstar Test and Evaluation Master Plan (TEMP), 25 Aug 92.
- (U) Milstar Acquisition Decision Memorandum, 28 Oct 92.

G. (U) RELATED ACTIVITIES:

- (U) PE #0302015F, (National Emergency Airborne Command Post, E-4B).
- (U) PE #0303142A, (DSCS Ground Terminals).
- (U) PE #0305119F, (Space Boosters).
- (U) PE #0604577N, (EHF Satellite Communications).
- (U) PE #0303109N, (Satellite Communications).
- (U) PE #0303603N, (Milstar Satellite Communications System).
- (U) PE #0303142A, (Tactical Communications Ground Environment).
- (U) PE #0303605F, (Satellite Ground Terminals).
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actuals</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
- (U) Aircraft Procurement (BA 10)					
Equip	0	15,467	22,153	159,076	393,396
Spares	0	1,706	957	0	29,863
- (U) Other Procurement (BA 16/P-1 Line 132)					
Equip	212,507*	84,516*	85,338	511,273	1,182,134
Spares	38,158	35,102	3,396	8,916	159,172
- (U) Military Construction (BA 24)					
Cost	12,350	0	3,000	2,580	27,748

* Includes Titan IV reprogramming

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

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Program Element: #0303601E
 PE Title: Milstar Satellite Communications System

Project: #2487
 Budget Activity: #3-Strategic Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
- Terminal/SMCS Interface	May 90	Demonstrated terminal and SMCS compatibility
- Phase III Interoperability DEMO (Support Navy IIIB Decision)	Oct 90	Verified tri-service interoperability
- Phase IIIA Interoperability DEMO	Mar 92	Verified tri-service interoperability
- Command Post Terminal Ops Assess	Aug 92	Verify readiness for production
- Final Sat 1 DT&E	Aug 92	Verified spacecraft and payload integration

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
- Phase IV-VIII interoperability DEMO	FY93-98	Verify tri-service interoperability
- Multi-service IOT&E Phase I	FY94	Terminals
- Narrowband Secure Voice Terminal Compatibility Implementation	FY94	
- Multi-service IOT&E Phase II	FY95	Mission Control
- Multi-service IOT&E Phase III	FY00	System and MDR

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303605F

Budget Activity: #4 - Tactical Programs

PE Title: Satellite Communications
(MILSATCOM) Terminals

A. (U) RESOURCES (\$ In Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Comp</u>	<u>Total</u> <u>Program</u>
3594 Single Channel Transponder System (SCTS)	600	1,570	1,399	Cont	TBD
3163 UHF Satellite Terminal System (USTS)	436	0	0		
3164 Ground Mobile Forces Terminals (GMFT)	508	2,575	0		
Total	1,544	4,145	1,399	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops military satellite communications terminals and associated modulator/demodulator (modem) equipment for use by the Air Force, and other Services. Developments currently underway address strategic and tactical deficiencies of US Military Satellite Communications (MILSATCOM) systems. There are three satellite terminal projects in this program element. The SCTS program was previously programmed and funded under PE 33601, Milstar. The funding associated with this pays for continuing support for the SCTS program.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3594, Single Channel Transponder System (SCTS):

Research and engineering conducted on the space segment of the SCTS program is required on a continuing/yearly basis in order to keep the aging DSCS, Polar, AFSATCOM (package on FLTSATCOM) satellite systems healthy and their transponders technically in tact until the Milstar program is fully operational. The SCTS program is part of the overall transition from AFSATCOM to Milstar, providing required jamming and nuclear effects protection for critical National Command Authorities (NCA) communications. More specifically, SCTS provides an Emergency Action Message (EAM) and Force Direction Message (FDM) dissemination capability to selected command centers and force elements.

(U) FY 1992 Accomplishments:

- (U) Conducted GAP analysis of UHF and SHF resources on AFSATCOM SCTS, UHF Follow-on and Milstar Hosts.
- (U) Conducted studies and analysis of the Polar Host satellite system.
- (U) Performed system timing upgrades to SCTS.

(U) FY 1993 Planned Program:

- (U) Conduct GAP analysis of UHF and SHF resources on AFSATCOM SCTS, UHF Follow-on and Milstar Hosts.
- (U) Perform SCTS system on-orbit capability testing.
- (U) Provide NEACP and SCTS flight test supports.

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Program Element: #0303605F

Budget Activity: #4 - Tactical Programs

PE Title: Satellite Communications
(MILSATCOM) Terminals

(U) FY 1994 Planned Program:

- (U) Conduct GAP analysis of UHF and SHF resources on AFSATCOM SCTS, UHF Follow-on and Milstar Hosts.
- (U) Monitor Polar Host development and production.
- (U) Participate in the development and testing of SCTS operational software.

(U) Work Performed By: Aerospace Corporation and General Elec of Los Angeles, CA. Space and Missile Center (SMC)/AFMC, Los Angeles AFB CA manages the program for the Air Force.

(U) Related Activities: The SCTS is a Joint Chiefs of Staff (JCS) program, which involves Army and Air Force RDT&E and implementation efforts. RDT&E required for the Air Force on this project is for the space segment exclusively. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): None.

(U) Military Construction (include dollars): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3163, UHF Satellite Terminal System (USTS): The USTS program was established to prove the then Military Airlift Command (now Air Mobility Command) a satellite communications terminal which incorporated Demand Assigned Multiple Access (DAMA) and Automatic Narrowband Digital Secure Voice Terminal (ANDVT) capabilities. Air Force was also designated lead agency in the development of the 5 kHz DAMA waveform for DOD. The Air Force was not able to obtain terminals under this program and is currently in negotiations with the contractor to establish acceptable terms for contract termination.

(U) FY 1992 Accomplishments:

- (U) Developed the 5 kHz DAMA waveform
- (U) Conducted analysis of DAMA Network Control Stations

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: Titan/Linkabit, San Diego CA. Electronic Systems Center (Air Force Materiel Command), Hanscom AFB MA, manages the program for the Air Force.

(U) Related Activities: The USTS program is related to the Navy developed 25 kHz UHF DAMA scheme, and the Army developed UHF manpack terminal (Enhanced Manpack UHF Terminal - EMUT) which incorporates the USTS 5 kHz DAMA scheme into their designs. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0303605F

Budget Activity: #4 - Tactical Programs

PE Title: Satellite Communications
(MILSATCOM) Terminals

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) Military Construction (include dollars): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3164, Ground Mobile Forces Terminals (GMFT): The Air Force GMFT program requires a small, lightweight SHF satellite communications terminal to provide reliable, secure voice and data for highly mobile combat teams such as Forward Air Controllers, Special Operations Forces, and Air Mobility Command (AMC) Combat Control Teams. This project will conduct a demonstration/validation effort for lightweight SHF satellite ground terminal technology to assess the feasibility of meeting user requirements with SHF manpack units. The development must achieve very compact lightweight units that can support flexible networks of many users with minimal impact on satellite resources.

(U) FY 1992 Accomplishments:

- (U) Initiated the demonstration/validation program for SHF lightweight manpack terminals.

(U) FY 1993 Planned Program:

- (U) Complete the demonstration/validation program for SHF lightweight manpack terminals.

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: RCA, Camden NJ. Electronic Systems Center (Air Force Materiel Command), Hanscom AFB, MA manages the program for the Air Force.

(U) Related Activities: GMFT is a joint service program addressing tactical force's satellite communications requirements of the Army, Air Force and Marine Corps. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) Military Construction (include dollars): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0303606F
 PE Title: UHF Satellite Communications

Project: # 2932
 Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES: (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
2932 Air Force Satellite Communications (AFSATCOM)	0	0	22,914	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: AFSATCOM provides reliable, enduring, world-wide command and control communications to designated Single Integrated Operational Plan (SIOP) nuclear capable users for: Emergency Action Message (EAM) dissemination, JCS-CINC internetting, force direction, and force report-back. Additionally, AFSATCOM capacity is provided for a limited number of high priority non-SIOP users for operational missions, contingency/crisis operations, exercise support and technical/operator training. AFSATCOM is also a program to develop, acquire, and field a Demand Assigned Multiple Access (DAMA) network control system and interoperable satellite communication terminals. The AFSATCOM System is presently being restructured to accommodate the new satellite channel configuration supported by the UHF Follow-On satellites. AFSATCOM Systems enhancements accommodate increased demand for beyond line-of-sight communications and joint service interoperability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments: Not Applicable

2. (U) FY 1993 Planned Program: Not Applicable

3. (U) FY 1994 Planned Program:

- (U) Begin concept exploration on the DAMA Network Control system and interoperable SATCOM terminals.
- (U) Begin development of the DAMA Controller and interoperable SATCOM terminals.

4. (U) Program to Completion:

- (U) Produce, deliver, and field ground and airborne interoperable SATCOM terminals.
- (U) Produce, deliver, and field the DAMA Network Control System.
- (U) This is a continuing program.

D. (U) Work Performed By: The prime contractors for this program effort are yet to be determined. The development and acquisition of the AFSATCOM DAMA Network Control and terminal upgrades are managed by the program office located at Air Force Materiel Command's Space and Missile Systems Center, Los Angeles AFB, CA under the direction of the Air Force Program Executive Office (PEO) for Space.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

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Program Element: 0303606F
PE Title: UHF Satellite Communications

Project: #2932
Budget Activity: #3 - Strategic Programs

F. (U) PROGRAM DOCUMENTATION:

- (U) Draft AFSPACECOM Mission Need Statement for an Improved UHF Satellite Communications Capability.
- (U) MJCS-63-89, UHF Satellite Communications Demand Assigned Multiple Access (DAMA) Requirement.
- (U) MJCS-36-89, UHF Satellite Secure Voice Policy.

G. (U) RELATED ACTIVITIES:

- (U) PE 0303601F, Milstar Satellite Communications System.
- (U) PE 0303605F, Satellite Ground Terminals.
- (U) There is no unnecessary duplication of effort within the AF or the DOD.

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MAJOR MILESTONES:

- | | | |
|----|---|------------|
| 1. | (U) Complete DAMA Terminal Concept Exploration | FY 1994 |
| 2. | (U) Narrowband Secure Voice Terminal Compatibility Implementation | FY 1994 |
| 3. | (U) DAMA Network Controller and Terminal Development Effort | FY 1994 |
| 4. | (U) DAMA Network Controller and Terminal Production deliveries | Late 1990s |

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FY 1994 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)

Budget Activity: #6-Defense Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
3275 Air Force Satellite Control Network (AFSCN)	85,033	82,253	104,870	Cont	TBD
3186 Automated Remote Tracking Station (ARTS)	23,311	14,800	0	0	TBD
4045 Integrated Satellite Control System (ISCS)	0	0	5,294	Cont	TBD
Total	108,344	97,053	110,164	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The AFSCN is a global network of communications and computer systems that control the growing inventory of increasingly complex national security space vehicles. The AFSCN project funds the development, acquisitions, and sustaining engineering needed to continue the evolution of this highly reliable national satellite tracking, telemetry and commanding capability to meet the requirements of the developmental and operational satellite systems it supports. The ARTS develops, procures, and installs advanced satellite command and control systems to increase AFSCN operational capability. ARTS equipment provides improved Tracking, Telemetry, and Commanding (TT&C) performance and reliability, lower life cycle costs associated with operations, reduces manpower required to support the AFSCN, and improves the interoperability/commonality with other satellite control networks. The ISCS project provides the architectural framework for an incremental evolution of DOD satellites, launch, and ground control systems. ISCS provides the ground control engineering effort needed to transition the AFSCN toward an integrated, interoperable, distributed, and cost-effective capability necessary to simplify operations, reduce life cycle costs, and perform operations even in non-nominal operations scenarios.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3186. Automated Remote Tracking Station (ARTS):

Develops, procures, and installs advanced satellite command and control systems to increase AFSCN operational capability. ARTS Acquisition Phase II modifies the ARTS full scale development design to meet new requirements, replaces and upgrades non-ARTS AFSCN tracking stations, provides two Transportable Vehicle Checkout Facilities (TVCF), and retrofits the initial four development sites.

(U) FY 1992 Accomplishments:

- (U) Provided system engineering and development of hardware and software modifications to meet evolving program requirements.
- (U) Completed and delivered two TVCFs, one to each of the Eastern and Western Test Ranges.
- (U) Completed IOC of modernized ARTS station at Guam side-A/B, Vandenberg side-A, and Hawaii side-A tracking stations.

(U) FY 1993 Planned Program:

- (U) Provide system engineering and development of hardware and software modifications to meet

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Program Element: #0305110F
PE Title: Satellite Control Network (SCN)

Budget Activity: #6-Defense Wide
Mission Support

evolving program requirements.

- (U) Complete IOC of modernized ARTS stations at New Hampshire-A and Indian Ocean Tracking stations.
- (U) Relocate ARTS Development and Modernization Facility from Sunnyvale, CA to permanent location in Colorado Springs, CO.
- (U) Complete ARTs FOC for all specified AFSCN tracking stations.
- (U) Program is scheduled to be completed by FY 93.

(U) Work Performed By: In-house efforts will be accomplished by the AF Material Command Space and Missile Systems Center, Los Angeles, CA. Principal contractors are: Loral Space & Range Systems, Sunnyvale, CA, provides general system engineering and integration support; Space Applications Corporation, San Jose, CA, provides system engineering integration and test analysis.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds (\$ In Thousands):

- (U) Other Procurement (BA 83. BPAC 834440)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	50,861	15,000	0	0	TBD

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4045. Integrated Satellite Control System (ISCS):

ISCS & Integrated Satellite Control (ISC) encompass launch, programs integral to launch, individual satellite programs, and space support systems. Part of the Space Support Program, the validated Air Force requirements were identified in a Joint Chiefs of Staff (JCS) approved ISCS MROC, and again in the Air Force ISC MNS. The system engineering and technology development project was initiated in FY 92, but funding was delayed pending completion of an FY 93 study under a separate program element. This project will use the product of the FY 93 study to lead the evolution of existing DoD satellites and their control systems (including the AFSCN). A significant deficiency identified during Desert Storm was the lack of interoperability between independent satellite control systems which hindered or impacted the timeliness of mission data and its contribution to our war-fighting capability. This approach will consolidate networks, integrate capabilities, and incorporate a standard of interoperability. It will result in improved responsiveness, operational efficiencies, and cost savings. If not funded, the ability of DoD space systems to support the war-fighter will remain deficient, independent (and non-interoperable) control systems will continue, and total costs will continue to rise if capabilities are to be maintained. Additionally, there are windows of opportunity within several new or block-change satellite programs and ground system enhancements which may be lost if funding is further delayed.

(U) FY 1992 Accomplishments and FY 1993 Planned Program: Delayed pending results of FY 93 study.

(U) FY 1994 Planned Program:

- (U) Develop simulation and analysis tools sufficient to model ISCS loading requirements, communication throughput, and resource utilization over a 15 year planning horizon.

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Program Element: #0305110F

PE Title: Satellite Control Network (SCN)

Budget Activity: #6-Defense Wide
Mission Support

- (U) Refine detailed ISCS distributed architecture.
- (U) Develop ISCS technology transition plans and architectural elements.
- (U) Sponsor ISCS specific technology development programs.
- (U) Influence ISCS related technology development programs.

(U) Work Performed By: In house efforts will be accomplished by the Space and Missile Systems Center (SMC), Los Angeles, CA. Study, engineering, and development analysis will be provided by SMC planning and engineering support contractors (undetermined pending re-competition).

(U) Related Activities:

- (U) PE 0703438F, Space System Survivability.
- (U) PE 0605808F, Developmental Planning.
- (U) PE 0603401F, Advanced Spacecraft Technologies.
- (U) PE 0603223C, SDI Technology Development.
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)

Project Number: 3275
Budget Activity: #6 - Defense Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Air Force Satellite Control Network (AFSCN)	85,033	82,253	104,870	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Funds the development, acquisition, and continuing support to a highly reliable national satellite tracking, telemetry, and commanding capability in support of developmental and operational satellite systems. The AFSCN is a global network of communications and computer systems required to support a growing inventory of increasingly complex space vehicles which support operational forces in peace and wartime. The AFSCN must continue to be responsive to the requirements of the satellite systems it supports.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Provided system engineering and development of network hardware/software modifications to meet evolving program requirements.
- (U) Completed transition of satellite programs from the old data systems configuration to a new computer configuration.
- (U) Completed upgrade of four stations under ARTS Acquisition II.
- (U) Retrofitted three ARTS Acquisition I stations to the Acquisition II configuration.
- (U) Completed Automated Scheduling project.

2. (U) FY 1993 Planned Program:

- (U) Provide system engineering and development of network hardware/software modifications to meet evolving program requirements at the Consolidated Space Test Center (CSTC).
- (U) Initiate engineering/modification support to the Consolidated Space Operations Center (CSOC).
- (U) Complete transition of satellite programs from the old data systems configuration to a new computer configuration.
- (U) Complete upgrade of three stations and two satellite prelaunch checkout facilities under ARTS Acquisition II.
- (U) Provide beginning of open architecture to the AFSCN control nodes.

3. (U) FY 1994 Planned Program:

- (U) Continue providing system engineering and development of network hardware/ software modifications to meet evolving satellite program requirements at the CSTC.
- (U) Provide engineering/modification support to the CSOC.
- (U) Begin design specification for Advanced Satellite Control upgrades.
- (U) Begin design specification for Network Communications Systems upgrades.

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Program Element: #0305110F
PE Title: Satellite Control Network (SCN)

Project Number: 3275
Budget Activity: #6 - Defense Wide
Mission Support

4. (U) Program to Completion:
- (U) This is a continuing program.
 - (U) Provide Advanced Satellite Control and Network Communications Systems upgrades.
- D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by the AF Material Command Space and Missile Systems Center, Los Angeles, CA. Principal contractors are: Loral Space & Range Systems, Sunnyvale, CA, provides study and development analysis for the range facilities and communications; Aerospace Corporation, El Segundo, CA, provides general system engineering and integration support;
- Space Applications Corporation, San Jose, CA, provides system engineering integration and test analysis (Small Business Set-Aside); Loral Space & Range Systems, Sunnyvale, CA, provides ARTS development and acquisition.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
- NARRATIVE DESCRIPTION OF CHANGES
1. (U) TECHNICAL CHANGES: Not Applicable.
 2. (U) SCHEDULE CHANGES: Not Applicable.
 3. (U) COST CHANGES: Not Applicable.
- F. (U) PROGRAM DOCUMENTATION:
- (U) AFSCN Program Management Directive 9038(18), Mar 92.
- G. (U) RELATED ACTIVITIES:
- (U) PE 0305151F, SCF Telecommunications.
 - (U) PE 0305894F, Real Property Maintenance, AFSC.
 - (U) PE 0305896F, Base Operating Support, AFSC.
 - (U) PE 0305130F, AFSCN Operations.
 - (U) There is no unnecessary duplication of effort within the Air Force or DoD.
- H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands):
- (U) Other Procurement (BA 83 and initial spares, BPAC 663276)
- | | FY 1992 | FY 1993 | FY 1994 | To | Total |
|------|---------------|-----------------|-----------------|-----------------|----------------|
| | <u>Actual</u> | <u>Estimate</u> | <u>Estimate</u> | <u>Complete</u> | <u>Program</u> |
| Cost | 27,552 | 34,701 | 32,505 | TBD | TBD |
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.
- J. (U) MILESTONE SCHEDULE:
1. (U) ARTS Diego Garcia Station IOC Jan 1992
 2. (U) ARTS Modification of Existing Stations 1992 - 1993
 3. (U) Complete Transition of All Satellite Programs to New Computer Configuration Feb 1992
 4. (U) ARTS Full Operational Turnover Sep 1993
 5. (U) Complete CSOC Communications Segment Operational 4Q FY 1993
 6. (U) CSOC FOC 4Q FY 1993

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305114E
PE Title: Air Traffic Control and
Landing Systems (ATCALS)

Budget Activity: # 5 -Intelligence
and Communications

A. (U) RESOURCES BY PROJECT (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2026, ATCALS Systems Support	476	635	287	Cont	TBD
3587, Microwave Landing System Avionics					
	<u>9,048</u>	<u>11,395</u>	<u>9,329</u>	<u>Cont</u>	<u>TBD</u>
Total	9,524	12,030	9,616	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This effort develops the Military Microwave Landing System Avionics (MMLSA), and procures the commercially developed Commercial Microwave Landing System Avionics (CMLSA). This acquisition is part of the twenty year program to transition Air Force operations from use of Precision Approach Radars (PAR) and Instrument Landing Systems (ILS) to the Microwave Landing System (MLS) for precision approach and landing. The MMLSA will be developed for integration and installation on space constrained aircraft. MMLSA will have both MLS and ILS capabilities. The CMLSA will be installed in aircraft that do not have size and weight constraints, such as the C-130. Project 2026 funds ongoing liaison, and interagency cooperative studies, between the USAF ATCALS program office and various organizations to include the other Services, the Federal Aviation Administration (FAA) and the International Civil Aviation Organization (ICAO).

C. (U) JUSTIFICATION FOR PROJECT LESS THAN \$10 MILLION IN FY 1994:

1. (U) Project 2026, System Support: This continuing effort funds ongoing liaison, and interagency cooperative studies, between the USAF ATCALS program office and various organizations to include the other Services, the FAA and the ICAO. Continues DT&E support for ATCALS programs including several joint efforts with the FAA.

(U) FY 1992 Accomplishments:

- (U) Continued support for all ATCALS projects.
- (U) Completed DT&E and began OT&E of the Tower Restoral Vehicle/Surveillance Restoral Vehicle (TRV/SRV).
- (U) Interfaced Global Positioning System (GPS) with air traffic control (ATC) systems developing operational procedures for ATC use of GPS.

(U) FY 1993 Planned Program:

- (U) Continue support for all ATCALS projects.
- (U) Complete OT&E for TRV. SRV was cancelled due to reduced funding and user identified higher priority needs.
- (U) Award TRV production contract.
- (U) Support integration of Special Use Airspace and air traffic control operations.

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Program Element: 0305114F
PE Title: Air Traffic Control and
Landing Systems (ATCALs)

Budget Activity: # 5 -Intelligence
and Communications

- (U) Support field test activities, interoperability evaluations, and related technical support between DoD and FAA for ATCALs and NAS.

(U) FY 1994 Planned Program:

- (U) Continue support for all ATCALs projects.
- (U) Continue TRV production.
- (U) Establish TRV depot.
- (U) Support field test activities, interoperability evaluations, and related technical support between DoD and FAA for ATCALs and NAS.

(U) Work Performed By: Air Force Systems Command Electronic Systems Center, Hanscom AFB, MA manages the overall ATCALs effort. Mitre Corporation, Bedford, MA, provides technical and engineering support.

(U) Related Activities:

- (U) Program Element #0305137F, National Airspace System.
- (U) Program Element #0305164F, Navstar Global Positioning System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project Number 3587. Microwave Landing System Avionics: This effort develops the Military Microwave Landing System Avionics (MMLSA), and procures the commercially developed Commercial Microwave Landing System Avionics (CMLSA). This acquisition is part of the twenty year program to transition Air Force operations from use of Precision Approach Radars (PAR) and Instrument Landing Systems (ILS) to the Microwave Landing System (MLS) for precision approach and landing. Transition from ILS to MLS will occur on a global level beginning in 1998. The International Civil Aviation Organization, of which the US is a member, has agreed to begin phase-in of MLS and phase-out of ILS in 1998. Similarly, NATO has likewise agreed to the 1998 phase-in of MLS in NATO Standardization Agreement 4184. Development of MLS and installation of MLS on Air Force aircraft is essential to ensure interoperability with the rest of the world. The MMLSA will be developed for integration and installation on space constrained aircraft. MMLSA will have both MLS and ILS capabilities. The CMLSA will be installed in aircraft that do not have performance, size and weight constraints, such as the C-130.

(U) FY 1992 Accomplishments:

- (U) Completed development and fabrication of MMLSA EMD Phase I test units.
- (U) Began F-16 MMLSA integration and system integration laboratory testing.
- (U) Completed MMLSA Early Operational Assessment.

(U) FY 1993 Planned Program:

- (U) Begin MMLSA EMD Phase II.
- (U) Begin aircraft installation kit development.
- (U) Continue MLS testing and integration.
- (U) Begin study with the FAA to determine a national precision approach strategy.

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Program Element: 0305114F
 PE Title: Air Traffic Control and
 Landing Systems (ATCALS)

Budget Activity: # 5 -Intelligence
 and Communications

(U) FY 1994 Planned Program:

- (U) Continue MMLSA EMD Phase II.
- (U) Continue aircraft installation kit development and MLS testing and integration..
- (U) Begin aircraft installation kit testing and integration.
- (U) Continue national precision approach strategy study.

(U) Work Performed By: MMLSA EMD Phase I contracts were awarded to Rockwell International, Cedar Rapids, Iowa; GEC/Marconi Corp, Wayne, NJ; and Hazeltine Corp, Greenlawn, NY. General Dynamics working with Aeronautical Systems Center, Wright-Patterson AFB, OH completed F-16 system integration laboratory testing. GEC/Marconi Corp, Wayne NJ, is producing the CMLSA system. Warner Robins Air Logistics Center, Warner Robins AFB, GA, is developing the kit to install the CMLSA on the C-130. Electronic Systems Center, Hanscom AFB, MA manages the MLS Avionics project.

(U) Related Activities:

- (U) Part of the overall USAF MLS acquisition which includes acquisition of the Fixed Base MLS, and Mobile MLS.
- (U) USAF lead agency for tri-service program working concurrently with the FAA.
- (U) Global Positioning System (GPS) to be investigated as an alternative to precision distance measuring equipment (Program Element #0305164F).
- (U) MLS Avionics will be installed on C-130 (Program Element # 0401115F) and F-16 (Program Element # 0207133F) aircraft.
- (U) Microwave Landing Systems support the DoD National Airspace System (NAS) program by modernizing air traffic control ground systems (NAS Program Element # 0305137F).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

(U) Procurement (Aircraft Procurement, BA 3587, P-1 Line 105):

	FY 1992	FY1993	FY1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	7,823	9,276	5,359	TBD	TBD
Quantities	(65)	(37)	(0)	(TBD)	(TBD)

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305119F

Budget Activity: #6-Defense Wide Mission Support

PE Title: Small and Medium Launch VehiclesA. (U) RESOURCES (\$ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
4233 Small Launch Vehicles	0	26,804	22,586	Cont	TBD
624A Medium Launch Vehicles	<u>40,404</u>	<u>22,855</u>	<u>35,916</u>	<u>Cont</u>	<u>TBD</u>
Total	40,404	49,659	58,502	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: National Security requirements dictate a continuing, highly reliable means of placing critical Department of Defense (DoD) satellites into required orbits. Assured access to space, directed by the President in the National Security Launch Strategy, will be accomplished through the use of a robust mix of Expendable Launch Vehicles (ELVs). The Medium Launch Vehicle (MLV) program provides procurement and launch of DoD ELVs, including Atlas II and Delta II at Cape Canaveral AFS, FL and Delta II, Atlas II, and Atlas E at Vandenberg AFB, CA. Pegasus will be supported by the Western and Eastern Test Ranges. This program also provides for engineering support of active launch programs and post-flight assessment of DoD ELVs to maintain their high reliability.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305119F
PE Title: Small and Medium Launch Vehicles

Project: 624A
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
624A Medium Launch Vehicles					
	40,404	22,855	35,916	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: National Security requirements dictate a continuing, highly reliable means of placing critical Department of Defense (DoD) satellites into required orbits. Assured access to space, directed by the President in the National Security Launch Strategy, will be accomplished through the use of a robust mix of Expendable Launch Vehicles (ELVs). The Medium Launch Vehicle (MLV) program provides procurement and launch of DoD ELVs, including Atlas II and Delta II at Cape Canaveral AFS, FL and Delta II, Atlas II, and Atlas E at Vandenberg AFB, CA. This program also provides for engineering support of active launch programs and post-flight assessment of DoD ELVs to maintain their high reliability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) One refurbished Atlas E booster successfully launched a Defense Meteorological Satellite Program (DMSP) satellite Nov 91.
- (U) An additional Atlas-E has been called to launch a NOAA satellite in Sep 92.
- (U) Delta II launched 4 Global Positioning System (GPS) satellites and 1 NASA Extreme Ultraviolet Explorer (EUVE) Satellite.
- (U) The first Atlas II/DSCS III was launched in Feb 92 from SLC 36A. A second Atlas II/DSCS launch occurred in Jul 92.

2. (U) FY 1993 Planned Program:

- (U) Delta II will launch 7 GPS satellites and procure 3 boosters in FY93, 2 for GPS missions and 1 for STP.
- (U) Two Atlas II boosters will be launched and Atlas Site II activation at VAFB is being managed.
- (U) The last Atlas E DMSP mission is planned in FY93. Subsequent DMSP satellites will launch on Titan II.
- (U) The MLV III contract will be awarded in the 3rd Qtr of FY93 and will include site activation, new mission design, and advance procurement for 2 boosters.

3. (U) FY 1994 Planned Program:

- (U) Delta II will continue to support the GPS constellation with the launch of 3 spacecraft in FY94.
- (U) Atlas II will launch 1 classified user payload and 1 DSCS III payload.
- (U) Site preparation for West Coast Atlas II will continue.
- (U) The last NOAA mission on an Atlas E is planned in FY94. The last Atlas E booster in the Air Force inventory remains unassigned. Subsequent NOAA missions are scheduled to fly on the Titan II.
- (U) Two MLV III boosters will be procured and advance procurement for three boosters will be initiated.
- (U) Atlas II will launch 1 DSCS III satellite.
- (U) Development funding provides recurring payload integration and systems engineering for all MLV's.
- (U) Space Launch Infrastructure Investment Program Program Decision Memorandum (PDM) increased MLV \$17M for Delta II safety and infrastructure improvements.

5. (U) Program to Completion:

- (U) This is a continuing program necessary to provide assured access for the Nation's critical space systems using Delta II, Atlas II, and MLV III booster.

D. (U) Work Performed By: The responsible Air Force agency is Air Force Material Command's Space and Missile Systems Center, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. Delta II contractors include: McDonnell Douglas Space Systems Corporation, Huntington Beach,

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Program Element: #0305119E

Project: 624A

PE Title: Small and Medium Launch Vehicles

Budget Activity: #6-Defense Wide Mission Support

CA (prime contractor); Rockwell International Corporation, Rocketdyne Division, Canoga Park, CA (stage 1 rocket engines); Aerojet Liquid Rocket Company, Sacramento, CA (stage 2 rocket engines); General Motors Corporation, Delco Electronics Division, Santa Barbara, CA (guidance); Morton Thiokol Corporation, Huntsville, AL and Elkton, MD (solid rocket motors); Hercules Corporation, Magna, UT (solid rocket motors). Atlas Contractors include: General Dynamics, Space Systems Division, San Diego, CA (integration, Centaur upper stage and airframe) and Rockwell International, Rocketdyne Division, Canoga Park, CA (rocket engines).

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Delay in MLV III contract award due to release of Clarification and Deficiency Requests.
3. (U) COST CHANGES: Changes due to congressional and OSD reductions and rephasing of MLV III procurement.

F. (U) PROGRAM DOCUMENTATION:

- (U) National Space Policy, January 1988.
- (U) Program Decision Memorandum, 25 July 1988.
- (U) MLV III MNS, 30 Nov 1992.

G. (U) RELATED ACTIVITIES:

- (U) Classified space programs.
- (U) Defense Satellite Communications System (DSCS)(PE 0303110F).
- (U) Global Positioning System (GPS)(PE0305165F).
- (U) Defense Meteorological Satellite Program (DMSP)(PE0305160F).
- (U) Space Test Program (STP) (PE0603402F).
- (U) National Oceanic and Atmospheric Administration (NOAA) polar orbiting meteorological satellites.
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands)

- (U) Missile Procurement (BA#5/MSML00)

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u> Cont	Total <u>Program</u> TBD
Quantity	4	4	2		

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.J. (U) MILESTONE SCHEDULE:

1. Atlas II first launch February 1992
2. MLV III contract award *(January 1993), April 1993
4. MLV III first launch 2nd Qtr FY 1996

* Dates presented in FY 1993 Descriptive Summary

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305119F
PE Title: Small and Medium Launch Vehicles

Project: 4233
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
4233 Small Launch Vehicles	0	26,804	22,586	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Access to space, directed by the President in the National Security Launch Strategy, will be accomplished for small Government payloads through the use of the small air launch vehicles (SLV). Primary SLV support is provided to Pegasus air launched vehicles supported by western and eastern launch ranges.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Preparation continued for DARPA's Pegasus contract transfer to the Air Force in FY93 in conjunction with the launch of a Space Test Program (STP) payload. The Air Force procured one Pegasus XL booster in FY92 on the Air Force Small Launch Vehicle (AFSLV) contract award in FY91.

2. (U) FY 1993 Planned Program:

- (U) Two Pegasus launches are planned in support of STP and one Pegasus XL boosters will be procured.

3. (U) FY 1994 Planned Program:

- (U) Will launch one Pegasus and two Pegasus XLs, and will buy one Pegasus XL.

4. (U) Program to Completion:

- (U) This is a continuing program necessary to provide assured access for the Nation's critical space systems using Pegasus.

D. (U) Work Performed By: The responsible Air Force agency is Air Force Material Command's Space and Missile Systems Center, Los Angeles AFB, CA. Pegasus contractors are: Orbital Sciences Corporation, Fairfax, VA (prime contractor); Hercules Aerospace Corporation, Magna, UT (solid rocket motor); Scaled Composites, Mojave, CA (composite wing).

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Third Pegasus flight slipped into FY 93 because of second flight anomalies.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) National Space Policy, January 1988.
- (U) Program Decision Memorandum, 25 July 1988.

G. (U) RELATED ACTIVITIES:

- (U) Space Test Program (STP) (PE0603402F).
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. AFSLV first launch 1st Qtr FY 1994

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305137F Project: # None
 PE Title: National Airspace System Budget Activity: #4-Tactical Programs
(NAS)

Project Title: National Airspace System (NAS)

No Photo Available

POPULAR NAME: NAS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ In Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program	MS I-07/92		MS II-01/94	MS III-2Q/97
Milestones				IOC-1Q/00 FOC-2Q/05
Engineering	MAMS			
Milestones	Prototype Complete			
T&E				DT.End - 2Q/96
Milestones				OT Start - 2Q/96 OT End - 4Q/96
Contract		MAMS EMD -		MAMS Prod-3Q/96
Milestones		10/93		
BUDGET	FY 1992	FY 1993	FY 1994	Program Total
(\$000)				(To Complete)
Major	1,589	2,736	14,073	
Contract				TBD - Cont.
Support	1,857	2,686	2,700	
Contract				TBD - Cont.
In-House	200	500	500	
Support				TBD - Cont.
GFE/	530	750	1,500	
Other				TBD - Cont.
Total	4.176	6.672	18.773	TBD - Cont.

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Program Element: #0305137F
PE Title: National Airspace System
(NAS)

Project: # None
Budget Activity: #4-Tactical Programs

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:
The DoD National Airspace System program will modernize the DoD air traffic control (ATC) system in parallel with the Federal Aviation Administration (FAA). DoD will acquire, to the maximum extent practical, systems on contract or systems to be on contract with the FAA to reduce development costs and prevent duplication. The DoD NAS program provides systems and facilities compatible/interoperable with the FAA modernization, prevents DoD flight delays and cancellations, continues DoD's access into Special Use Airspace, provides transparent services to military and civil aircraft, replaces aging DoD ATC systems, and increases flight safety. The Military Airspace Management System (MAMS) will effectively schedule and manage special use airspace. DoD military ATC and fighting/flying readiness will be maintained.
- C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
1. (U) FY 1992 Accomplishments:
 - (U) Completed MAMS prototyping.
 - (U) Conducted site surveys, environmental assessments.
 - (U) Continued program definition and specification development for NAS systems.
 - (U) Completed Cost and Operational Effectiveness Analysis (COEA) for Concept Exploration Phase.
 - (U) Received Concept Demonstration Approval. Entered Demonstration and Validation Phase.
 2. (U) FY 1993 Planned Program:
 - (U) Award MAMS Engineering & Manufacturing Development (EMD) contract.
 - (U) Conduct MAMS System Design & Software Specification Reviews.
 - (U) Continue site surveys, facility/transition planning.
 - (U) Begin update of the COEA to support Development Approval decision.
 - (U) Begin development of NAS Integration Plan.
 - (U) Evaluate Secondary Surveillance Radar requirements.
 - (U) Update NAS specifications.
 3. (U) FY 1994 Planned Program:
 - (U) Continue MAMS EMD Contract.
 - (U) Continue site surveys, facility/transition planning.
 - (U) Begin development of DoD Common Console.
 - (U) Continue the development of the NAS Integration Plan.
 - (U) Continue update of the COEA.
 - (U) Begin overall technical/engineering and integration of NAS subsystems for each DoD site.
 - (U) Award NAS Test Systems contracts.
 - (U) Funding increase from 1993 pays for increased MAMS EMD effort, the start of DoD Common Console development effort, and the start of the site specific engineering and integration work.
 - (U) Identify NAS requirements for Major Range and Test

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Program Element: #0305137F
PE Title: National Airspace System
(NAS)

Project: # None
Budget Activity: #4-Tactical Programs

Facility Bases (MRTFBs)

4. (U) Program to Completion:

- (U) Installation and testing of NAS equipment in prototype air traffic control facilities (Control Towers, Military Terminal Radar Approach Controls (MTRACON), Consolidated Radar Approach Controls (CRF) and Major Range and Test Facility Bases (MRTFBs) in FY 96-98.
- (U) Acquisition and installation, if appropriate, of the Advanced Automation System, Voice Communications Switching System, Mode S, Digital Airport Surveillance Radar, and other systems in FY 97-2002.
- (U) DoD ATC facilities modifications/construction starting in FY96.
- (U) IOC FY 2000.
- (U) Integration of DoD NAS systems/facilities, FY 1998-2005.

D. (U) Work Performed By: This program is managed by Electronic Systems Center, Hanscom AFB, MA. USAF is the lead Service and responsible for the management of the Joint Service program office. Contractor(s) are TBD. Developmental efforts for the NAS automation system, the airport surveillance radar, Mode S radar beacon system, and others are the responsibility of the FAA. Engineering support provided by MITRE Corp, Bedford, MA, and Martin-Marietta Corp, Washington, DC.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Rephasing the program to reduce cost and technical risk resulted in IOC and FOC being shifted outward.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Air Force Communications Command Statement of Need 04-87, National Airspace System Compatible Air Traffic Control Facilities, 27 Oct 87.
- (U) Mission Need Statement, MAMS, JROCSM 88-099, 12 Dec 88
- (U) Memorandum of Agreement Between the Federal Aviation Administration and the Department of Defense on Radar Approach Controls in the NAS, 14 Dec 88.
- (U) Joint Requirements Oversight Council Mission Need Statement for NAS modernization, JROCSM 89-019-89, 17 May 89.
- (U) DoD Directive 5030.19, DoD Responsibilities on Federal Aviation and NAS Matters, 22 Jun 89.
- (U) Federal Aviation Administration Capital Investment Plan, Dec 90.
- (U) Operational Requirements Document 001-85-I, Military Airspace Management System (MAMS), 12 Dec 91.

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Program Element: #0305137F

Project: # None

PE Title: National Airspace System
(NAS)

Budget Activity: #4-Tactical Programs

- (U) NAS Acquisition Decision Memorandum, 13 Nov 90.
- (U) Joint Systems Operational Requirements Document (JSORD 04-87), ATCALs for Terminal and Special Use Airspace in the NAS, 30 Nov 90
- (U) Cost and Operational Effectiveness Analysis (COEA), 23 Apr 92

G. (U) RELATED ACTIVITIES:

- (U) NAS is part of the overall effort for the USAF acquisition of Air Traffic Control and Landing Systems (ATCALs) (PE #0305114F).
- (U) Program Element #0604504N, Navy ATCALs.
- (U) Program Element #P665801.M44, Army ATCALs.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Operational Requirements Document, National Airspace System (NAS), 14 May 92.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) Procurement (BA 16):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	0.0	0.0	0.0	348.1	348.1

(U) Military Construction (BA 24):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	0.0	0.0	0.0	25.0	25.0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
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None.

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
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NAS DT&E Start/Finish	Jul 95/Sep 96	
MAMS DT&E Start/Finish	Jul 95/Sep 95	
MAMS IOT&E Start/Finish	Apr 96/Jul 96	
NAS IOT&E Start/Finish	Sep 96/Mar 97	

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305138F
PE Title: Upper Stages Program

Budget Activity: #6 - Defense-wide Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
4053 Upper Stages Development (Inertial Upper Stage)	5,731	1,627	4,141	Cont	TBD
XXX2 Space Nuclear Thermal Propulsion (SNTF) Program	0 *	53,635	0	Cont	TBD
Total	5,731	55,262	4,141	Cont	TBD

* Air Force program initiated in FY 1992 in PE 0603105F.

- B. (U) BRIEF DESCRIPTION OF ELEMENT: The Upper Stages Program was initiated to provide consolidated acquisition of upper stages to support the DOD Mission Model. The majority of the Upper Stages effort is in support of the Initial Upper Stage (IUS). The effort includes flight operations at the Eastern Launch Site (ELS), FL and support to flight operations at the Consolidated Space Test Center (CSTC), and reimbursable acquisition and operations support of upper stages for NASA as documented in MOA/MOU's between USAF and NASA. All remaining AF IUSs will launch Defense Support Program Satellites from the East Coast. Analyses support the study of anomalies and design funding supports the redesign of outdated equipment. We also do centralized management for the definition of changes to the NASA Cargo Transfer Vehicle based on validated DOD user requirements. Lastly, the program continuously evaluates and improves upper stage reliability, cost effectiveness, and responsiveness.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 4053, Upper Stage Development (Inertial Upper Stage):
Provides quick response studies and analyses by the prime contractor in support of mission requirements. Effort includes improving mission effectiveness, anomaly testing and resolution, variance analyses, and resolution of problems during launch preparation. Provides independent verification and validation of flight software for each IUS vehicle prior to launch to insure there are no mission impacts caused by improper software.

(U) FY 1992 Accomplishments:

- (U) Provided quick response studies/analyses in support of 2 DOD missions.
- (U) Provided technical analyses concurrent with long lead for 2 IUSs.

(U) FY 1993 Planned Program:

- (U) Provide studies/analyses in support of at least 1 DOD mission.
- (U) Provide technical analyses concurrent with the long lead for 2 IUSs (production restart).
- (U) Provide technology assessment studies of future upper stage requirements.

(U) FY 1994 Planned Program:

- (U) Provide studies/analyses in support of at least 1 DOD mission.
- (U) Provide technology assessment studies for future upper stage requirements.

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Program Element: #0305138F
PE Title: Upper Stages Program

Budget Activity: #6 - Defense-wide Mission Support

- (U) Work Performed By: The responsible AF agency is AF Materiel Command's Space and Missile Systems Center, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. The prime contractor for IUS, associated integration, engineering support and launch support is Boeing Defense and Space Group, Seattle, WA. Independent verification of flight software is performed by Martin Marietta Corporation, Denver, CO.

(U) Related Activities:

- (U) PE 0305144F, Titan IV Acquisition.
- (U) PE 0102431F, Defense Support Program.
- (U) PE NASA Space Transportation System.
- (U) PE 0305171F, Space Shuttle Operations.
- (U) PE 0603105F, Olympic.
- (U) Various NASA scientific and communications satellites.
- (U) There is no unnecessary duplication of effort within the AF, DOD or NASA.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Missile Procurement (BA 5):

	FY 1992	FY 1993	FY 1994	FY 1995	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	61,323	88,300	79,100	199,500	Cont	TBD

- (U) International Cooperative Agreements: Not applicable.

2. (U) Project XXX2, SNTP Program:

The objective of this program was to provide the technology base, design, develop, integrate, and validate, via ground test, a prototype nuclear rocket engine for a variety of exoatmospheric applications. The Program was offered to DOE and they did not accept. The Air Force plans to terminate with FY 93 resources.

(U) FY 1992 Accomplishments:

- (U) Successful development of fuel kernels with sealings that withstood temperatures in excess of 3000K.
- (U) Completed fabrication and tested a low PBR critical experiment (CX).
- (U) Completed preliminary safety analysis report.

(U) FY 1993 Planned Program:

- (U) Continue Nuclear Element Tests
- (U) Continue advanced fuel fabrication.
- (U) Continue materials testing.
- (U) Terminate

- (U) FY 1994 Planned Program: Not applicable.

- (U) Work Performed By: The responsible AF agency is AF Materiel Command's Space and Missile Systems Center's Phillips Laboratory, Albuquerque, NM. The program office is currently managed by DOD, but the AF is attempting to transfer program to DOE or NASA. Systems engineering is provided by Xerad, Santa Monica, CA. System integration is Grumman Space Systems Division, Bethpage, NY. Other efforts are contracted with: Garrett Fluid Systems Division (Allied Signal), Tempe, AZ; Hercules Aerospace company, Magna, UT; Babcock & Wilcox, Lynchburg, VA; Aerojet TechSystems Company, Sacramento, CA; General Dynamics Space Systems, San Diego, CA.

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Program Element: #0305138E
PE Title: Upper Stages Program

Budget Activity: #6 - Defense-wide Mission Support

(U) Related Activities:

- (U) PE 0603105F in FY 1992.
- (U) There is no unnecessary duplication of effort within the AF, DOD or NASA.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305144E
PE Title: Titan IV Space Launch Vehicle

Project: 4135
Budget Activity: 6-Defense Wide Mission Support

Project Title: Titan IV Space Launch Vehicle

PHOTOGRAPH NOT AVAILABLE

POPULAR NAME: Titan IV

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	Solid Rocket Motor Assembly Facility IOC		SRMU Initial Launch Capability (ILC)	
Engineering Milestones		First TIV Centaur Flight		First SRMU Flight
T&E Milestones	SRMU Pre-Qualification Retest	Complete SRMU Test Program		
Contract Milestones				
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	131.045	118.155	314.376	1,221.769
Support Contract	1.372	4.039	2.744	15.094
In House Support	9.115	9.106	9.098	80.149
GFE/Other*			4.522	30.221
Total	141.532	128.300	330.740	1,347.233

*Titan II

- B. (U) **BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:** National Security requirements dictate a continuing, highly reliable means of placing critical DOD satellites into required orbits. The Titan IV program provides the capability to launch the largest of these satellites into near-earth or geosynchronous orbits from either the east or west coast launch facilities. This program is developing several different configurations for the Titan IV (No Upper Stage (NUS), Inertial Upper Stage (IUS), and Centaur).

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Program Element: #0305144E
 PE Title: Titan IV Space Launch Vehicle

Project: 4135
 Budget Activity: 6-Defense Wide Mission Support

In addition, the Titan IV program is developing a Solid Rocket Motor Upgrade (SRMU) and new programmable avionics and ground support equipment to meet reliability and increased performance requirements. This program provides continuing integration support to the payload community as well as continuing engineering support and post-flight analyses to enhance system characterization and reliability. Titan IV performance, by configuration is summarized below:

<u>Configuration</u>	<u>Mission Orbit</u>	<u>Performance (lbs to orbit)</u>
Titan IV/Centaur/SRM	Geosynchronous	10,000
Titan IV/Centaur/SRMU	Geosynchronous	11,500
Titan IV/IUS	Geosynchronous	5,200
Titan IV/NUS/SRM	Low Earth (Polar)	31,100
Titan IV/NUS/SRMU	Low Earth (East)	47,800

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) SRMU qualification program (PQM-1', QM-1) firings.
- (U) Launch Complex 40 (LC-40) Activation.
- (U) Continue Programmable Aerospace Ground Equipment (PAGE) development.
- (U) Completed construction of Solid Motor Assembly and Readiness Facility (SMARF).
- (U) Continue integration activity for Milstar and Defense Support Program (DSP).

2. (U) FY 1993 Planned Program:

- (U) Launch first Titan IV/Centaur.
- (U) Achieve Titan IV/Centaur Initial Launch Capability (ILC) at LC-40.
- (U) Complete SRMU qualification firing program.
- (U) Achieve SRMU ILC.
- (U) Continue construction of Centaur Processing Facility (CPF) and design CPF AGE.
- (U) Continue integration for DSP and Milstar.

3. (U) FY 1994 Planned Program:

- (U) Industrial Base Protection required to support vendor base for follow-on buy.
- (U) Activate Western Range (WR) PAGE.
- (U) Continue integration for DSP and Milstar.

4. (U) Program to Completion:

- (U) This is a continuing program.
- (U) Continue flight assessment, reliability enhancement, and obsolete part replacement until all vehicles are flown.

D. (U) Work Performed By: The Program Executive Officer for Space is responsible for program management, with the program office located at Space and Missile Systems Center, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. Prime contractor is Martin Marietta Corp, Denver, CO.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

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Program Element: #0305144F
PE Title: Titan IV Space Launch Vehicle

Project: 4135
Budget Activity: 6-Defense Wide Mission Support

NARRATIVE DESCRIPTION OF CHANGES

1. (U) **TECHNICAL CHANGES:** The Centaur Processing Facility was de-scoped in response to reduced launch rate requirements. Current effort will provide storage and limited processing capability.
 2. (U) **SCHEDULE CHANGES:** The Titan IV/Centaur ILC has slipped to summer 1993 due to Atlas/Centaur launch failers.
 3. (U) **COST CHANGES:** Production of Titan IV vehicles has been slowed down due to decreased launch requirements.
- F. (U) **PROGRAM DOCUMENTATION:**
- (U) National Space Policy, Jan 1988.
 - (U) Program Decision Memorandum, 25 Jul 1988.
 - (U) Titan IV SORD, 2 Apr 1991.
- G. (U) **RELATED ACTIVITIES:**
- (U) Classified Space Programs (funds classified user launch vehicles and VAFB launch services).
 - (U) PE #0102431F (Defense Support Program).
 - (U) PE #0303603F (Milstar).
 - (U) PE #0305119F (Medium Launch Vehicles).
 - (U) PE #0305181F (Western Range).
 - (U) PE #0305182F (Eastern Range).
 - (U) There is no unnecessary duplication of effort within the AF or DOD.
- H. (U) **OTHER APPROPRIATION FUNDS (\$ in Thousands):**
- (U) Missile Procurement (BA 5):
- | | FY 1992 | FY 1993 | FY 1994 | To | Total |
|------|---------------|-----------------|-----------------|-----------------|----------------|
| | <u>Actual</u> | <u>Estimate</u> | <u>Estimate</u> | <u>Complete</u> | <u>Program</u> |
| Cost | 287,500* | 345,848 | 471,585 | 1,601,551 | 8,964,551 |
- * Funding for Titan IV prior to FY92 and all MILCON contained in PE 0305119F.
Starting FY94, PE 0305144F also includes budget for Titan II
- (U) Other Procurement (BA 83)(includes spares):
- | | FY 1992 | FY 1993 | FY 1994 | To | Total |
|------|---------------|-----------------|-----------------|-----------------|----------------|
| | <u>Actual</u> | <u>Estimate</u> | <u>Estimate</u> | <u>Complete</u> | <u>Program</u> |
| Cost | 0 | 0 | 0 | 300 | |
- (U) Military Construction
- | | FY 1992 | FY 1993 | FY 1994 | To | Total |
|------|---------------|-----------------|-----------------|-----------------|----------------|
| | <u>Actual</u> | <u>Estimate</u> | <u>Estimate</u> | <u>Complete</u> | <u>Program</u> |
| Cost | 24,000* | 33,000* | 0 | 0 | 126,400 |
| Qty | 0 | 0 | 0 | 11 | 24 |
- * Funding for Titan IV prior to FY92 and all MILCON contained in PE 0305119F.
- I. (U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** Not applicable.

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Program Element: #0305144E
PE Title: Titan IV Space Launch Vehicle

Project: 4135
Budget Activity: 6-Defense Wide Mission Support

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
SRMU Full-scale burst	14 Nov 89-17 May 90	Avg pressure exceeded requirements
SRMU PQM-1 firing	1 Apr 91	Case burst when pressure limit exceeded
SRMU PQM-1' firing	12 Jun 92	Retest within specification limits
SRMU QM-1 firing	Sep 92	Met requirements
SRMU QM-2 firing	Feb 93	Met requirements at low temperature

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
QM-3	May 93	
QM-4	Aug 93	Begin production motor casting after QM-4

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305145F
PE Title: Arms Control

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ In Thousands):

Project

Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
4189 Minuteman III (MMIII) De-MIRVing Preparation	9000	3804	2000	0	14950
4190 Treaty Prep/Verification Support	5639	382	2107	TBD	TBD
4283 Open Skies Treaty Systems Development	0	0	3000	TBD	TBD
<u>Total</u>	14639	4226	7107	TBD	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element directly supports implementation and planning for current and pending arms control agreements. It includes MMIII de-MIRVing actions required to meet reentry vehicle (RV) limitations under the Strategic Arms Reduction Talks (START) Treaty and the START II Treaty by providing single RV (SRV) capability to the MM III ICBM fleet. Treaty preparation/verification support activities encompass a wide range of projects necessary to prepare the United States for compliance with impending arms control treaties and negotiations. Open Skies support includes development of Synthetic Aperture Radars (SAR) and SAR media processing equipment required to support the Open Skies Treaty mission.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 4189, MMIII De-MIRVing: This project enables the USAF to comply with START Treaty requirements that mandate a new RV platform when downloading the MMIII to a SRV configuration. This project includes the research and development costs associated with the new bulkhead design, design testing, and limited production, as well as the software modifications and testing necessary for successful launch in the SRV configuration.

(U) FY 1992 Accomplishments:

- (U) Began design of new RV platform.
- (U) Fabricated test platforms.
- (U) Began modification of existing MMIII software that enables successful flight in the SRV configuration.

(U) FY 1993 Planned Program:

- (U) Complete design of new SRV platform.
- (U) Continue modification of MMIII software.

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Program Element: #0305145F
PE Title: Arms Control

Budget Activity: #3 - Strategic Programs

(U) FY 1994 Planned Program:

- (U) Complete and test hardware and software modifications that permit successful flight in the SRV configuration.

(U) Work Performed By: The contractors for the SRV de-MIRVing effort are Logicon of San Pedro, CA; GTE of Boston, MA; TRW of San Bernadino, CA; Rockwell International of Anaheim, CA; and General Electric of Philadelphia, PA. Hill AFB, Utah is the in-house developing organization responsible for the SRV de-MIRVing program.

(U) Related Activities:

- (U) PE 0101213 Minuteman Squadrons
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Missile Proc., BSA 3 Modifications/WSC 21XXX:

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Funds	7100	5400	4700	5500	22700
Quantities	1	192	210	210	612

(U) International Cooperative Agreements: None.

2. (U) Project 4190, Treaty Prep/Verification Support: This project supports costs directly associated with preparing for implementation of arms control treaties and agreements. It includes research and analysis activities associated with preparing the Air Force to meet a myriad of required taskings and prepares the USAF to support immediate compliance with existing agreements and analyze implications of future agreements and negotiations.

(U) FY 1992 Accomplishments:

- (U) Supported implementation, design, and development of the START Tracking and Reporting System (STARS).
- (U) Supported telemetry demonstrations, interpretation of telemetric data, analytical research, and troubleshooting of all USG telemetric data to comply with the requirements of the START Treaty.
- (U) Supported HQ program management, including design and development of an AF-wide, multi-level access, arms control network necessary to manage the rapid developments in the field of international negotiations and arms control.
- (U) Provided for support of arms control related Air Staff travel, and supported resolution of MAJCOM oversight.
- (U) Provided support for preparation of monitoring activities at Thiokol's Strategic Operations Facility required for START.
- (U) Supported initial research into Air Force installation site diagram digitization.

(U) FY 1993 Planned Program:

- (U) Completes development and supports implementation of the AF-wide, multi-level arms control management network.

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Program Element: #0305145F
PE Title: Arms Control

Budget Activity: #3 - Strategic Programs

- (U) Begins large scale site diagram development and testing of 120 major Air Force installation site diagrams.
- (U) Continues support of analytical research conducted through existing contractors in support of arms control related activities levied on the USAF by State Department, OSD, and Interagency taskings.
- (U) Continues support of arms control related Air Staff travel, and supports MAJCOM oversight caused by uncertainties in the international negotiations process.
- (U) Provides for contractor support in preparation for implementation and planning associated with Chemical Weapons Convention (CWC) compliance.

(U) FY 1994 Planned Program :

- (U) Provides for contractor support in areas relating to the Non-Proliferation Treaty, a Comprehensive Test Ban, and counter-proliferation policy and programs.
- (U) Provides for contractor support for development of treaty education systems and tools.
- (U) Provides for on-site contractor support for the Arms Control Program Element Monitor (PEM).
- (U) Continues support of analytical research conducted through existing contractors in support of unforeseen arms control related actions levied on the AF by State Department, OSD and Interagency taskings, such as START III.
- (U) Provides for contractor support in preparation for implementation and planning associated with CWC compliance.
- (U) Completes site diagram development to incorporate all Air Force installations.

(U) Work Performed By :

- (U) The contractors for the Treaty Prep/Verification Support effort are SAIC of McLean, VA; Sandia National Laboratories of Albuquerque, NM; and TRW of San Bernadino, CA.

(U) Related Activities :

- (U) None.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) None.

(U) International Cooperative Agreements : None.

3. (U) Project 4283, Open Skies Treaty Systems Development: This project enables the USAF to develop systems necessary to comply with the Open Skies Treaty. It includes funding needed to complete Defense Nuclear Agency's (DNA) development of both prototype Synthetic Aperture Radars (SARs). Funding is required for modification of the software for processing of the SAR magnetic tape and to conduct flight test operations. This project also includes funding needed to complete development of a capability that meets international Stage III aircraft noise abatement standards. Without this funding, the USAF and the U.S. Government will be unable to comply with its international obligations under the Open Skies Treaty.

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Program Element: #0305145F
PE Title: Arms Control

Budget Activity: #3 - Strategic Programs

(U) FY 1992 Accomplishments :

- Not Applicable

(U) FY 1993 Planned Program :

- Not Applicable

(U) FY 1994 Planned Program:

- (U) Complete development of DNA's two prototype Synthetic Aperture Radars (SARs).
- (U) Complete developmental testing (DT&E) of prototype SARs.
- (U) Complete development of a Stage III aircraft noise abatement capability.

(U) Work Performed By: DNA is responsible for development of the prototype SARs. Contractor for development of aircraft noise abatement is TBD. Tinker AFB, Oklahoma City, OK is the in-house developing organization responsible for aircraft acquisition for the Open Skies Treaty.

(U) Related Activities :

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Aircraft Proc., BSA 5/WSC C13500:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Funds	7100	51186	0	TBD	TBD
Quantities		2		1	3

- (U) Other Proc., BSA 2/WSC 826990:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Funds	0	0	39	TBD	TBD

- (U) Other Proc., BSA 3/WSC 837190:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Funds	0	5	0	0	5

- (U) Other Proc., BSA 4/WSC 845310:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Funds	0	153	0	TBD	TBD

(U) International Cooperative Agreements : None.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305158F

Budget Activity: #4 - Tactical Programs

PE Title: Constant Source

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
4071 Constant Source	11,893	7062	3245	Cont	TBD
Total	11,893	7062	3245	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program established as part of the AF TENCAP normalization effort. Program leverages national and tactical capabilities to deliver near-real-time threat information directly to combat units/aircrews for mission planning and mission execution. This information enables air crews to effectively avoid, defeat, or destroy enemy threat systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 4071, Constant Source:

Efforts include software engineering, P3I upgrades, and development of a miniaturized, airborne qualified, multi-channel, multi-source capability (i.e., receive and correlate inputs from national and tactical sources simultaneously) for airborne and ground deployment.

(U) FY 1992 Accomplishments:

- (U) Continued development of the airborne qualified system called the Multi-mission Advanced Tactical Terminal (MATT).
 - (U) Two flyable MATT prototypes completed.
 - (U) Planned for MATT integration into SOF aircraft.
 - (U) Conducted DT&E and continued planning for a FY93 IOT&E.
 - (U) Commenced preparation for a Milestone III decision.
- (U) Commenced upgrade of ground systems to a multi-channel capability.
 - (U) Desert Storm supplemental of \$3.7M to accelerate this effort.

(U) FY 1993 Planned Program:

- (U) Complete EMD of the airborne system.
 - (U) Deliver 10 MATT units for IOT&E and R&M testing.
 - (U) Award a competitive production contract.
- (U) Update software and execute ECPs for ground systems as required.

(U) FY 1994 Planned Program:

- (U) Execute ECPs for air/ground systems as required.
- (U) Update software for air/ground systems as required.
- (U) Plan for outyear refurbishment/replacement of off-the-shelf computer hardware.

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Program Element: #0305158F
PE Title: Constant Source

Budget Activity: #4 - Tactical Programs

(U) Work Performed By: Work is managed jointly by the Directorate of Communication and Intelligence Systems, Electronic Systems Center (ESC/IC), Hanscom AFB, MA and the Navy's Systems Application Program Office (SAPO), Space and Naval Warfare Systems Command (SPAWAR 42). Top four contractors include Assurance Technology Corp., Carlisle, MA; BTG, Inc., Vienna, VA; Mnemonics, Inc., Melbourne, FL; and Harris Corp., Melbourne, FL.

(U) Related Activities:

- (U) Program #0207247F, AF TENCAP
- (U) Program Element #0208019F, Tactical Cryptologic Activities
- (U) Program Element #0305159I, Defense Reconnaissance Support Program
- (U) Program Element #0305885G, Tactical Cryptologic Program
- (U) Program Element #0304111F, Special Activities
- (U) Constant Source formally interfaces with numerous national programs/ agencies, the Major Commands and their components, the Air Staff, Office of the Secretary of Defense, Secretary of the Air Force, and the other Services in order to optimize the system's utility and to synchronize design efforts with other system developments.
- (U) There is no unnecessary duplication of effort within the Air Force. The Army is developing a similar capability (i.e., the Commanders Tactical Terminal/ Hybrid Receive only) to the Constant Source airborne system (i.e., MATT).

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Other Procurement (PE #0305158F, BA #4):

	FY 1992	FY1993	FY1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	1,935	23,525	10,889	Cont	TBD

Note: Funds procure off-the-shelf ground based equipment; SOF (MFP 11) funds programmed for airborne system procurements are not included.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305160E

Project: DMSP

PE Title: Defense Meteorological Satellite Program (DMSP)

Budget Activity: 6-Defense Wide Mission Support

Project Title: Defense Meteorological Satellite Program (DMSP)

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POPULAR NAME: DMSP

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	F-11 Launch		Milestone Revw	
Engineering Milestones			Mark IVB IOC	Begin Block 6 System Qual 2Qtr FY1998
T&E Milestones	Mark IVB OT&E		STT Ops Design Demo	STT IOT&E
Contract Milestones	Begin Mark IVB Prdctn	Begin Deliv 5D-3 Primary Sensor	STT LRIP	Final MarkIVB Delivery 3Qtr FY 97
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	19,208	13,675	20,677	Continuing
Support Contract	7,179	6,705	9,449	Continuing
In House Support	1,511	1,408	991	Continuing
GFE/Other	281	150	836	Continuing
Total	28,179	21,938	31,953	Continuing

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The DMSP is a fully operational Joint-Service meteorological satellite program which supports all military services. Operational commanders require timely, quality weather information to effectively employ weapon systems and protect DOD resources. DMSP is the DOD's most important single source of global weather data. It provides visible and infrared cloud cover imagery (1/3 nm constant resolution) and other meteorological, oceanographical, and solar-geophysical information. These data are required over the entire earth in support of strategic and tactical operations. At least 2 satellites are required in sun synchronous 450 nm polar orbit at all times. (Sun synchronous means the satellites cross the equator at the same local sun time on each of their 14 orbits/day). This program includes the spacecraft and sensors; ground command, control and communications (C3) facilities and personnel;

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Program Element: #0305160F

Project: DOSP

PE Title: Defense Meteorological Satellite Program (DOSP)

Budget Activity: 6-Defense Wide Mission Support

Air Force strategic, fixed, and transportable, tactical data receipt and processing terminals; and operations and maintenance. (Through the decade DOSP will gradually transition from Block 5D production to Block 6 development. This long lead time for satellite system development and production will allow significant risk reduction. Thus, Block 6 development will proceed in parallel with the current Block 5D efforts.) DOSP will launch on Atlas-E launch vehicles through FY 1993, then transition to Titan II.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:
 - (U) Delivered the first Block 5D-3 satellite (S-15).
 - (U) Finished Block 5D-3 launch facility upgrades.
 - (U) Continued system integration and test and sensor development, calibration, and validation and related support activities.
 - (U) Completed DOSP Enhancement at New Hampshire Tracking Station.
 - (U) Completed Mark IVB development.
 - (U) Completed Mark IVB IOT&E and begin Mark IVB production.
 - (U) Continued Block 6 advance development contracts for technology risk reduction.
 - (U) Launched Satellite F-11.
2. (U) FY 1993 Planned Program:
 - (U) Continue system integration and test and sensor development, calibration, and validation and related support activities.
 - (U) Continue Mark IVB production.
 - (U) Continue Block 6 advanced development contracts for technology risk reduction.
 - (U) Continue readiness to transition to Titan II launch vehicle.
 - (U) Begin Small Tactical Terminal (STT) Acquisition.
 - (U) Begin DOD/DOC/NASA requirements consolidation study.
3. (U) Program to Completion:
 - (U) This is a continuing program.
 - (U) Continue system integration and test and sensor development, calibration, and validation and related support activities.
 - (U) STT operational design demonstration.
 - (U) Begin Mark IVB enhanced algorithm integration effort.
 - (U) Complete Block 6 System Requirements Review (Include feasible Joint DOD/DOC/NASA Requirements).
 - (U) Launch Satellite F-12
 - (U) Continue Small Tactical Terminal algorithm development into FY 1998.
 - (U) Continue Block 6 risk reduction through FY 1998, down select to one prime contractor, and begin Engineering Manufacturing development in FY98 after the completion of Milestone review.

D. (U) Work Performed By:

Development and procurement are managed by AFMC's Space and Missile Systems Center, Los Angeles AFB CA. Major contractors include: General Electric, Astro Space Division, East Windsor NJ (spacecraft, and satellite integration); Westinghouse Electric Corp, Baltimore MD (primary cloud imaging sensor); Aerojet Electro-system Azusa CA (microwave sounders and imagers); Harris Corp, Melbourne FL (ground systems); and Lockheed Missiles & Space Company, Austin, TX (Mark IVB).

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Program Element: #0305160E

PE Title: Defense Meteorological Satellite Program (DMSP)

Project: DMSP

Budget Activity: 6-Defense Wide Mission Support

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Determine feasibility of including DOC requirements in Block 6 effort.
2. (U) SCHEDULE CHANGES: Block 6 slipped one year to accommodate potential inclusion of DOC requirements.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Agreement between DOC, NASA and DOD concerning polar operational meteorological satellite systems.
- (U) Joint-Service MOA (USAF/USN/USA/DOD), 15 Dec 76.
- (U) USAF SON 508-78, 28 Dec 78.
- (U) USAF SON 01-83, 17 Mar 83.
- (U) JCS Requirements Memorandum 154-86, 1 Aug 86.
- (U) USAF SON 02-80, 14 Feb 86.
- (U) TEMP, 19 Apr 91.
- (U) USAF SON 505-79, 8 Sept 88.
- (U) SORD, 26 Dec 90.
- (U) AFSPACECOM MNS 020-91, Environmental Sensing, 13 Aug 92.

G. (U) RELATED ACTIVITIES:

- (U) DMSP is a Joint-Service program in accordance with the MOA. The Air Force is the Executive Agent with responsibility for the Space, C3, and Air Force User Segments. Each Service funds its own User Segment and any Service unique changes to other segments.
- (U) PE #0305160N, DMSP, jointly funds microwave imager procurement.
- (U) The Marine Corps procured 12 Mark IV tactical terminals.
- (U) Close coordination is maintained with the civilian weather satellite programs of the DOC. The DOD and DOC systems have different missions and sensors. Interchange of technology and joint efforts have been continuous, with special emphasis on spacecraft bus commonality and avoiding duplication of effort. Effort underway to assess feasibility of consolidating DOD/NASA and DOC requirements as part of Block 6 effort.
- (U) PE #0305119F, Space Boosters Program.
- (U) PE #0305162F, DMSP Communications.
- (U) Navy and Army jointly fund Block 6 studies.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

	(U) Missile Procurement (BA 23):				
	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	106,115	30,945	29,384	Cont	TBD
Quantity	2	0	0		
	(U) Other Procurement (BA 83)(includes spares):				
Cost	17,972	16,755	23,590	Cont	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

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Program Element: #0305160F

Project: DMSP

PE Title: Defense Meteorological Satellite Program (DMSP)

Budget Activity: 6-Defense Wide Mission Support

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
F-10 On-Orbit Checkout and Turnover to AFSPACECOM	Jan 91	Fully Operational
F-11 On-Orbit Checkout and Turnover to AFSPACECOM	Dec 91	Fully Operational
Mark IVB OT&E Completed	May 92	Successful completion

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
Small Tactical Terminal	Jun 94	On Schedule

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305164F
 PE Title: Navstar Global Positioning
 System (GPS) User Equipment

Project: 3028
 Budget Activity: 5-Intelligence
 and Communication

Project Title: Navstar Global Positioning System

See PE 0305165F for Photo

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	Milestone III DAB	N/A	N/A	N/A
Engineering Milestones	N/A	N/A	N/A	N/A
T&E Milestones	MAGR QOT&E PLGR OT&E	PLGR QT&E PLGR OOT&E	PLGR QOT&E MAGR FOT&E	N/A
Contract Milestones	Full Rate Production Option	Full-Rate Production Option	Full-Rate Production Option	N/A
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	9,917	15,959	11,364	Continuing
Support Contract	2,750	2,900	3,300	Continuing
In House Support	1,420	1,465	1,500	Continuing
GFE/Other	600	0	0	Continuing
Total	14,687	20,434	16,164	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element funds Research and Development to integrate Navstar Global Positioning System (GPS) user equipment into Air Force airborne and ground platforms. Military forces need precise location data to enhance command and control and to engage in strategic and tactical warfare. The GPS satisfies these requirements and improves target mapping, the probability of target acquisition, flexible routing, low-level ingress/egress, and accuracy of weapons

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Program Element: #0305164F
PE Title: Navstar Global Positioning
System (GPS) User Equipment

Project: 3028
Budget Activity: 5-Intelligence
and Communication

delivery. GPS is a space based navigation system which provides highly accurate position, velocity and time. GPS consists of three segments. The space segment (funded in PE 0305165F) is the satellite constellation which provides the worldwide navigation signals. The control segment (also funded in PE 0305165F) measures and corrects satellite performance parameters and provides a user interface to the system. The user equipment (UE) segment consists of the electronic equipment and interfaces necessary to receive and process GPS satellite signals into position, velocity and time data for its various military uses. Navstar GPS is the largest avionics modification program in the DoD today.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued development of Integrated Support Facility.
- (U) Delivered Miniaturized Airborne GPS Receiver (MAGR) engineering development hardware (85 units), and completed Operational Test & Evaluation on AV-8B.
- (U) Continued Independent Verification and Validation (IV&V) on platform integrations and on UE software.
- (U) Continued integration study activities for various aircraft platforms.
- (U) Awarded contract for GPS Timing Receivers (TGR).

2. (U) FY 1993 Planned Program:

- (U) Continue to support development testing for aircraft integrations.
- (U) Complete development of software Integrated Support Facility.
- (U) Continue IV&V on platform integrations and on UE software.
- (U) Initiate software block upgrade for the 5-channel GPS airborne receiver.
- (U) Conduct product improvement studies for the Embedded GPS Receiver (EGR), Space-Based Receiver (SBR), Advanced GPS Receiver (AGR), anti-jam technologies, GPS enhancements for Combat Search and Rescue (CSAR) equipment, differential GPS, precision approach, and integrity.

3. (U) FY 1994 Planned Program:

- (U) Continue to support development testing for aircraft integrations.
- (U) Continue developing software block upgrade for 5-channel GPS airborne receiver.
- (U) Continue IV&V on platform integrations and on UE software.
- (U) Continue product improvement studies for EGR, SBR, AGR, anti-jam, GPS upgrades for CSAR equipment, differential GPS, precision approach, and integrity.

4. (U) (U) Program to Completion

- (U) This is a continuing program.
- (U) Continue to support development testing for aircraft integrations.
- (U) Continue developing software block upgrade for 5-channel GPS airborne receiver.
- (U) Continue IV&V on platform integrations and on UE software.
- (U) Continue product improvement studies for EGR, SBR, AGR, anti-jam, GPS enhancements for CSAR equipment, differential GPS, precision approach, and integrity.

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Program Element: #0305164F
PE Title: Navstar Global Positioning
System (GPS) User Equipment

Project: 3028
Budget Activity: 5-Intelligence
and Communication

D. (U) Work Performed By:

The acquisition of GPS is managed by a Joint Program Office located at the Air Force Material Command's Space and Missile Systems Center, Los Angeles AFB, CA. User equipment is produced by Rockwell International, Collins Avionics and Communications Division, Cedar Rapids, IA; Quantic Industries Inc, San Carlos CA; E-Systems, Clearwater FL; Trimble Navigation Inc, Sunnyvale CA; and SCI, Huntsville AL. Intermetrics, Cambridge, MA, is the user equipment software independent verification/validation contractor. Holloman Air Force Base (AFB) and Army Electronic Proving Ground (EPC) Yuma AZ provide technical support to the program for UE testing. The Joint Service Systems Management Office (JSSMO) located at Robins AFB provides technical support to the program for the development of the Integrated Support Facility. The Air Force Wright Laboratory at Wright Patterson AFB and Eglin AFB provide advanced technology support to the program. The Naval Research and Development Center, Warminster, PA and the Naval Air Warfare Center, Indianapolis, IN, are providing technical and validation support to the program office for joint service user equipment development and production.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Added PLGR and TGR QT&E.
3. (U) COST CHANGES: FY93 reduction due to reduced inflation and other general programmatic reductions. Reduction in support contracts due to improved efficiency.

F. (U) PROGRAM DOCUMENTATION:

- (U) Acquisition Decision Memorandum, January 1992.
- (U) Integrated Program Assessment, January 1992.
- (U) Integrated Program Summary, December 1991.
- (U) Integrated Multi-Service Test and Evaluation Master Plan, October 1991.
- (U) System Operational Requirements Document, January 1990.
- (U) Navstar GPS Baseline, 22 December 1989.

G. (U) RELATED ACTIVITIES:

- (U) GPS development and operational implementation are joint activities. AF is Executive Agent and develops, procures, and operates space and control segments. Services jointly develop and procure user equipment through the Joint Program Office.
- (U) Other agencies are the Army, Navy, Marine Corps, Defense Mapping Agency, Dept of Transportation, North Atlantic Treaty Organization (NATO), and Australia.
- (U) Coordination obtained through a Joint Program Office.
- (U) PE 0603601F, Conventional Weapon Technology.
- (U) PE 0305165F, Navstar GPS (Space/Ground).
- (U) PE 0101221N, Fleet Ballistic Missile Systems, range positioning.
- (U) PE 0301357F and 0305913F, Nuclear Detonation Detection System (NDS).
- (U) PE 0305119F, Medium Launch Vehicles.
- (U) PE 0305130F, Consolidated Space Operations Center (CSOC).
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

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Program Element: #0305164F
PE Title: Navstar Global Positioning
System (GPS) User Equipment

Project: 3028
Budget Activity: 5-Intelligence
and Communication

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Aircraft Procurement (BP 11,12,16,19):

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost	108,177	92,240	72,803	Cont	TBD
Quantities		43	131	245	

- (U) Other Procurement (BA 83):

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost	4,920	7,396	5,595	Cont	TBD
Quantities	0	571	360		

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: In April, 1978, a Memo of Understanding (MOU) was signed with 9 NATO allies and with Australia to permit NATO and Australian participation in developing of GPS user equipment. The MOU created an international team at the US Joint Program Office (JPO). Nations involved included UK, Norway, the Netherlands, Italy, Germany, France, Denmark, Canada, Belgium, and Australia. In 1987 Spain became the 10th NATO signatory to the MOU. In 1991, Australia signed an agreement for 20 years in duration that allows access to PPS and the purchase of production UE. In 1991, a new NATO MOU added Portugal, Turkey, and Greece. This MOU will expire at the end of 1993. A new MOU with the duration of 20 years is under negotiation with NATO countries to cover the operational phase of GPS: access to PPS, security of PPS and development, production and marketing of PPS user equipment.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
OT&E	Dec 90-Jul 91	Additional Air force, Army, and Navy OT Force accomplished. All equipment exceeded MTBOMF requirements.
QOT&E	Apr-Dec 92	MAGR

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
QOT&E	Oct- Jan 94	PLGR
QT&E	Sep 92-Dec 93	PLGR Bid Sample Testing
FOT&E	Oct 93-As needed	PLGR, MAGR

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305165F

PE Title: Navstar Global Positioning
System (GPS) Space/Control

Project: 3030

Budget Activity: 5-Intelligence
and Communication

Project Title: Navstar Global Positioning System

POPULAR NAME: GPS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	ToComplete
Program Milestones	N/A	IOC 3Q-FY93	N/A	N/A
Engineering Milestones	N/A	N/A	N/A	N/A
T&E Milestones	N/A	N/A	Control Segment Phase III IOT&E	N/A
Contract Milestones	Begin IIR Satellite Prod	N/A	N/A	N/A
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	46,285	51,197	32,204	Continuing
Support Contract	1,576	2,130	1,282	Continuing
In House Support	2,432	1,650	2,790	Continuing
GFE/Other	1,000	1,245	2,750	Continuing
Total	51,293	56,222	39,026	Continuing

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Program Element: #0305165F
PE Title: Navstar Global Positioning
System (GPS) Space/Control

Project: 3030
Budget Activity: S-Intelligence
and Communication

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element funds Research and Development for the Navstar Global Positioning System (GPS) space and control segments of the overall GPS program. This includes: satellite development, procurement, deployment, and operation of the ground control segment; upgrades to the space and ground segments; and R&D efforts to support deployment of the entire GPS system. Military forces need precise location data to enhance command and control and to engage in strategic and tactical warfare, especially at night and in adverse weather. The GPS satisfies these requirements. GPS is a space based radio positioning and navigation system which provides worldwide passive, all-weather, and all-altitude precise three-dimensional position (16 meter spherical error probable), velocity (0.1 meter/second), and time (within 0.1 microsecond). These capabilities, coupled with the inherent feature of highly accurate silent user operation, enhance the force effectiveness and survivability of many U.S. weapon systems. GPS consists of three segments. The space segment is the satellite constellation which provides the worldwide navigation signals. GPS satellites also carry Nuclear Detonation (NUDET) Detection System sensors as additional payloads. The control segment measures and corrects satellite performance parameters and provides a user interface to the system. It consists of five monitor stations and three ground antennae located around the world and a Master Control Station (MCS) at Falcon AFB CO, and a Phase 1 back-up MCS at Gaithersburg, MD. The user equipment segment (funded by PE0305164F) consists of the electronic equipment and interfaces necessary to receive and process GPS satellites signals into position, velocity, and time data for its various military uses.
- C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
1. (U) FY 1992 Accomplishments:
 - (U) Operational satellite launches/on-orbit support continued.
 - (U) Completed System Design Review for the software upgrades supporting Block IIR space vehicles.
 - (U) Phase I Back-up Master Control Station (IBUMCS) capabilities successfully demonstrated to AFSPACECOM at the IBM facility in Gaithersburg, MD.
 - (U) Continued software development for two major releases supporting tasks from the Oct 87 Program Management Responsibility Transfer and the Apr 90 system turnover agreement.
 2. (U) FY 1993 Planned Program:
 - (U) Operational satellite launches/on-orbit support will continue.
 - (U) Complete qualification testing of first Block IIR satellite.
 - (U) Deliver first major ground control segment software upgrade to AFSPACECOM.
 - (U) Complete Preliminary Design Review for the next upgrade to ground control segment software.
 3. (U) FY 1994 Planned Program:
 - (U) Operational satellite launches/on-orbit support will continue.
 - (U) Deliver second major ground control segment software upgrade to AFSPACECOM.
 - (U) Continue code development of the last major ground control segment software upgrade.
 - (U) Deliver upgraded mainframe computers to the ground control segment to support the Block IIR satellites.
 4. (U) Program to Completion:
 - (U) This is a continuing program.
 - (U) Operational satellite launches/on-orbit support will continue.
 - (U) Deliver Block IIR ground control segment software upgrade to AFSPACECOM.

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Program Element: #0305165F
PE Title: Navstar Global Positioning
System (GPS) Space/Control

Project: 3030
Budget Activity: 5-Intelligence
and Communication

D. (U) Work Performed By:

The acquisition of GPS is managed by a Joint Program Office under the DAC, located at Los Angeles AFB, CA. The Block II satellite contractor is Rockwell International, Seal Beach, CA. ITT, Nutley, NJ (Block IIR), and Rockwell International, Autonetics Strategic Systems Division, (Block II) Anaheim, CA, are the subcontractors for the navigation subsystems. The Block IIR satellite contractor is General Electric, East Windsor, NJ. Operational control segment development and deployment is being done by IBM, Federal Systems Division, Gaithersburg, MD. User equipment is produced by Rockwell International, Collins Government Avionics Division, Cedar Rapids, IA and SCI, Huntsville, AL.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Block IIR design delayed due to survivability "operate through" issue. Nine month program impact, but this slip results in an Oct 95 first satellite delivery--no impact to launch schedule.
3. (U) COST CHANGES: OSD added funds in FY 93 to fully fund the General Electric "operate through" survivability requirement.

F. (U) PROGRAM DOCUMENTATION:

- (U) Decision Coordinating Paper 133 (Rev A), 17 Jan 78.
- (U) System Operational Requirements Document, January 1990.

G. (U) RELATED ACTIVITIES:

- (U) GPS development and operational implementation are joint activities. Air Force is Executive Agent. Air Force develops, procures, and operates space and control segments. Services jointly develop and procure user equipment through the Joint Program Office.
- (U) Other agencies are the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation, North Atlantic Treaty Organization (NATO), and Australia.
- (U) Coordination obtained through a Joint Program Office.
- (U) PE 0305164F, Navstar GPS (User Equipment), provides receivers to use the positioning, navigation and timing signals from satellites.
- (U) PE 0101221N, Fleet Ballistic Missile Systems, range positioning.
- (U) PE 0301357F and 0305913F (formerly 0102433F), Nuclear Detonation Detection System (NDS), fund NDS payloads on the GPS satellites.
- (U) PE 0305119F Space Boosters, funds launch services (Delta II).
- (U) PE 0305130F, Consolidated Space Operations Center (CSOC), funds CSOC which hosts the operational GPS Master Control Station.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0305165F
 PE Title: Navstar Global Positioning
System (GPS) Space/Control

Project: 3030
 Budget Activity: 5-Intelligence
and Communication

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Missile Procurement (BA 23, Weapon System 29, Advanced Procurement 30):

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Cost	186,845	184,799	172,305	Cont	TBD
Quantity	4	4	4		
- (U) Other Procurement (BA 83) including initial spares:					
Cost	1,848	5,849	4,177	4,866	Cont TBD
Quantities	0	0	0	0	

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
Control Segment Follow-on OT&E	1991 and 1993	On Schedule

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
Control Segment Phase III IOT&E	3Q-FY94	On Schedule

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FY 1994 BUDGET RDT&E SUMMARY SHEET

Program Element: #0305181F
PE Title: Western Range

Project Number: 1008
Budget Activity: #6 - Defense Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Range Standardization and Automation	0*	0*	9,546	0	9,546

* Not a new start. The initial procurement of the project was funded with Other Procurement Funds in FY 93 and prior years.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Western Range is the nation's primary space launch site for polar-orbit missions and for the testing of Intercontinental Ballistic Missiles. The various capabilities of the Western Range, such as radar tracking, telemetry reception, optical tracking, and communications, are essential to the space launch and test operations. Virtually all range systems are aging, increasingly unmaintainable, and are based on an inefficient architecture. Replacement of the aging systems is a necessity, and the Range Standardization and Automation (RSA) project is designed to make these replacements to produce a more efficient range infrastructure, capable of providing superior support at lower operating cost. The RSA project will develop an integrated range system, using remote control and automation techniques to reduce operating manpower requirements and produce improved responsiveness. The primary development of RSA will be done under the Eastern Range Program Element (0305182F). The designs developed for the Eastern Range will be applied to the Western Range in order to reduce development costs and ensure commonality. The RSA RDT&E funding for the Western Range will be used to adapt the Eastern Range designs for the requirements of the Western Range. RSA is critical to the future of the launch ranges; performance and cost goals cannot be achieved without RSA.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments and FY 1993 Planned Program: Not applicable.
2. (U) FY 1994 Planned Program:
 - (U) Begin development effort for the project at Eastern Range.
3. (U) Program to Completion:
 - (U) The Eastern Range RSA project will continue and designs developed will be applied to the Western Range.
 - (U) Estimated completion is FY 2003.

D. (U) Work Performed By: The contract for the RSA design, development, and installation effort will be awarded competitively.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Not applicable.

F. (U) PROGRAM DOCUMENTATION:

- (U) Air Force Space Command Mission Need Statement 022-91, Spacelift Range Standardization and Automation

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Program Element: #0305181F
PE Title: Western Range

Project Number: 1008
Budget Activity: #6 - Defense Wide
Mission Support

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0305182F (Eastern Range).
- (U) The designs developed for RSA at the Eastern Range will be applied to the Western Range.
- (U) There is no unnecessary duplication of effort within the AF or DoD.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Other Appropriations, BSA/WSC, P-1 Line 122, BPAC 8300:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	0	0	0	100	100

* Funds associated with the RSA project are used to procure both non-developmental and new hardware requiring development work.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|--------------------------------------|----------------|
| 1. (U) Contract Award | February 1994 |
| 2. (U) Complete System Design | September 1995 |
| 3. (U) Complete RSA at Western Range | September 2003 |

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FY 1994 BUDGET RDT&E SUMMARY SHEET

Program Element: #0305182F
PE Title: Eastern Range

Project Number: 4137
Budget Activity: #6 - Defense Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Range Standardization and Automation	0*	0*	41,242	239,700	280,942

*Not a new start. The initial procurements of the project were funded with Other Procurement funds in FY 93 and prior years.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Eastern Range is the nation's primary space launch site. The various capabilities of the Eastern Range, such as radar tracking, telemetry reception, optical tracking, and communications, are essential to the launch of space missions and the testing of ballistic missiles. Virtually all range systems are aging, increasingly unmaintainable, and are based on an inefficient architecture. Replacement of the aging systems is a necessity, and the Range Standardization and Automation (RSA) project is designed to make these replacements so as to produce a more efficient range infrastructure, capable of providing superior support at lower operating cost. The RSA project will develop an integrated range system, using remote control and automation techniques to reduce operating manpower requirements and produce improved responsiveness. RSA is critical to the future of the launch ranges; performance and cost goals cannot be achieved without RSA.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 and FY 1993 Accomplishments: Not applicable
2. (U) FY 1994 Planned Program:
 - (U) Begin development effort consisting of system and component level design, with initial emphasis on the down range tracking site at Antigua, followed by the tracking site at Ascension.
 - (U) Develop the Telemetry Integrated Processing System (TIPS) as part of the RSA project. Enables computerized analysis and display of telemetry information, replacing the aging and highly labor-intensive strip chart recorders currently in use.
3. (U) Program to Completion:
 - (U) Continue develop effort to include design and integration of the control station into the Range Operations Control Center.
 - (U) Begin equipment installation at the Antigua tracking site.
 - (U) Complete upgrade of the Antigua and Ascension tracking sites.
 - (U) Convert the range sites on Cape Canaveral AFS, FL, and add the required control interfaces to the Range Operations Control Center.
 - (U) Estimated completion is FY 2000.

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Program Element: #35182F

PE Title: Eastern Range

Project Number: 01

Budget Activity: #6 - Defense Wide
Mission Support

D. (U) Work Performed By: Computer Sciences/Raytheon, located at Patrick AFB, FL. The contract for the RSA design, development, and installation effort will be awarded competitively.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Not applicable.
No FY 1993 Descriptive Summary exists.

F. (U) PROGRAM DOCUMENTATION: Air Force Space Command Mission Need Statement 022-91, Spacelift Range Standardization and Automation.

G. (U) RELATED ACTIVITIES:

- (U) PE #0305181F (Western Range).
- (U) The designs developed for RSA will also be applied to the Western Range.
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Other Procurement, BSA/WSC P-1 Line 122, BPAC 8300:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	25,000	49,412	52,610	cont	cont

* Funds associated with the RSA project used to procure non-developmental and new hardware requiring development work. There are also other funds in the PE used for non-RSA procurements.

- (U) Military Construction

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	0	0	0	cont	cont

* Military Construction funds are used to construct new buildings to house the new RSA equipment are in PE 78022F. PE 36182 also contains other MILCON funds not associated with RSA facilities.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

The Antigua and Ascension sites are operated under agreements with foreign governments. The Antigua site land is leased from the Government of Antigua. The Ascension site land is used under agreements with the United Kingdom dating back originally to the Lend Lease agreements of 1940.

J. (U) MILESTONE SCHEDULE:

- | | |
|---------------------------------------|----------------|
| 1. RSA Contract Award | March 1993 |
| 2. Complete RSA System Design | September 1994 |
| 3. Complete Cape Canaveral conversion | September 1995 |
| 4. Complete Antigua site | September 1997 |
| 5. Complete Ascension site | September 1998 |
| 6. Complete mainland site | September 2000 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305887F Budget Activity: #4 - Tactical Programs
PE Title: Electronic Combat Intelligence Support

A. (U) RESOURCES (\$ In Thousands)

Project

<u>Number &</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To</u>	<u>Total</u>
<u>Title</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
2907 Electronic Combat (EC) Intelligence Support					
	<u>1,841</u>	<u>1,790</u>	<u>2,004</u>	<u>9,384</u>	<u>15,019</u>
Total	1,841	1,790	2,004	9,384	15,019

B. (U) BRIEF DESCRIPTION OF ELEMENT:

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2907, Electronic Combat Intelligence Support:

(U) FY 1992 Accomplishments:

- (U) Participants were ACC, AFSOC, AMC and AFMC

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Program Element: #0305887F Budget Activity: #4 - Tactical Programs
PE Title: Electronic Combat Intelligence Support

(U) FY 1993 Planned Program:

- (U) Extensive evaluations and reporting to be accomplished

(U) FY 1994 Planned Program:

- (U) Extensive evaluations and reporting to be accomplished

(U) Work Performed By: HQ Air Combat Command, HQ Air Force Materiel Command, HQ Air Force Special Operations Command, HQ Air Mobility Command, HQ Air Force Operational Test and Evaluation Center and their subordinate units.

(U) Related Activities:

(U) Not applicable.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

(U) Not applicable.

(U) International Cooperative Agreements:

(U) Not applicable.

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FY 1994/1995 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305905F

Project: #5905

PE Title: Improved Space-Based TW/AA
System (ISBTW/AA)

Budget Activity: #3-Strategic Programs

Project Title: Improved Space-Based TW/AA Systems (Formerly FEWS)

POPULAR NAME: ISBTW/AA (Formerly FEWS)

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	MS I DAB 12/91	DAB Prog. Review 8/93	MS II DAB 6/94	Continuing Program
Engineering Milestones		SRR 1/93	D/V SDR 1/94	Continuing Program
T&E Milestones		TPAR 7/93		Continuing Program
Contract Milestones	RFP Rel 3/92 D/V Awd 7/92		EMD RFP 3/94 D/V Comp 7/94 EMD Awd 8/94	Continuing Program
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	50,000	198,000	162,000(D/V) 15,000 (EMD)	Continuing
Support Contract	4,251	18,747	20,000	Continuing
In House Support	17,070	14,468	11,444	Continuing
GFE/Other	5,139	5,342	6,350	Continuing
Total	76,460	236,557	214,794	Continuing

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Program Element: #0305905F
PE Title: Improved Space-Based TW/AA
System (ISBTW/AA)

Project: #5905
Budget Activity: #3-Strategic Programs
Date: April 13, 1993

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM

CAPABILITIES: The purpose of the ISBTW/AA program (also known as the Follow-on Early Warning System or FEWS) is to select and develop a satellite which provides increased performance over the existing Defense Support Program (DSP-1) satellite. The ISBTW/AA spacecraft primary mission is to provide initial warning of a ballistic missile attack on the US. The ISBTW/AA satellite will incorporate new technologies that would enhance detection and provide direct reporting of ICBM/SLBM launches and improve space based surveillance of tactical ballistic missile launches worldwide. This program consists of three parts: a Space Segment (SS), a Fixed Ground Segment (FGS), and a Survivable Ground Segment (SGS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Award of two 24-month Demonstration/Validation (Dem/Val) phase contracts.
- (U) Continued to improve the development and manufacturing capabilities required to produce the sensor focal plane.
- (U) Further development of non-volatile memories and analog circuits.
- (U) Studied the possibility of insertion of next generation data processing technologies.

2. (U) FY 1993 Planned Program:

- (U) Continuation of Dem/Val phase contracts.
- (U) Technology Producibility Assessment Review (TPAR) to determine producibility of critical, risk technologies in four areas - optics, focal plane, communications, and data processing.
- (U) Intensive development of flight-like software code.
- (U) Fabricate and test critical optics components using state-of-the art null lens techniques.
- (U) Define requirements for and design on-board data processing.
- (U) Ground-based testing of the telescope system.
- (U) DAB Program Review.

3. (U) FY 1994 Planned Program:

- (U) System Design Review for Dem/Val.
- (U) Milestone II DAB.
- (U) Award one EMD contract.

4. (U) Program to Completion:

- (U) This is a continuing program.

D. (U) Work Performed By:

Work during FY1992 through 1994 for ISBTW/AA Dem/Val phase is being performed by Lockheed Missiles and Space Company, Sunnyvale, CA and TRW Incorporated, Redondo Beach, CA.

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Program Element: #0305905F

Project: #5905

PE Title: Improved Space-Based TW/AA
System (ISBTW/AA)

Budget Activity: #3-Strategic Programs

Date: April 13, 1993

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Dem/Val Contract award slipped from June 92 to July 92.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:

- (U) FEWS Statement of Operational Need (SON), 29 July 88.
- (U) System Operational Requirements Document (SORD), 9 August 91.
- (U) Joint Requirements Oversight Council Memorandum (JROC M-057-091), 18 October 91.

G. (U) RELATED ACTIVITIES:

- (U) PE #0102431F (Defense Support Program).
- (U) PE #0305911F (Space Activities).
- (U) PE #0603425F (Follow-on Early Warning System).
- (U) PE #0305144F/0305171F (Titan Space Boosters/Space Launch Support).
- (U) PE #0102310F/0102313F (Cheyenne Mountain Upgrade Programs/ Integrated TW/AA System).
- (U) PE #0305110F/0305151F (AF Satellite Control Network).
- (U) PE #0912011F (Construction Planning and Design).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Not Applicable

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
DT&E/IOT&E	3QFY00 to 3QFY03	On-orbit testing of first three satellites

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305906F

Budget Activity: #3 - Strategic Programs

PE Title: NCMC - TW/AA Systems

A. (U) RESOURCES (\$ in Thousands)

Project

<u>Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3880 Cheyenne Mountain Upgrade (CMU)	118,400	140,817	131,149	Cont	TBD
3881 Integrated TW/AA	<u>9,200</u>	<u>10,284</u>	<u>10,692</u>	<u>Cont</u>	<u>TBD</u>
Total	127,600	151,101	141,841	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds the replacement systems for the Integrated Tactical Warning/Attack Assessment (TW/AA) network's command, control, and communications (C3) functions within the Cheyenne Mountain Complex (CMC) and at selected forward users. This replacement program is designed to incrementally upgrade and replace the current operational systems without loss of attack warning capability during the phased transition. The Integrated TW/AA architecture must respond to a flexible, coordinated (missile, air, and space) attack threat. The program has two related projects: The first, CMU's six system acquisitions are one project, which is supported by the second project--Integrated TW/AA System Engineering. The second project provides interface analysis and disconnect resolution between CMU and over twenty other Integrated TW/AA systems and program upgrades. Together these two projects insure the Commanders-in-Chief, United States Space Command (USCINCSpace) and North American Aerospace Defense Command (CINCNORAD), other nuclear-capable CINCs, the Joint Chiefs of Staff, and the National Command Authorities of the US and Canada will have the timely, reliable, and unambiguous attack warning and assessment data required to meet national security needs into the next century.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10 MILLION IN FY 1994: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems

Project Number: 3880
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
3880 Cheyenne Mountain Upgrade (CMU)	118,400	140,817	131,149	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Cheyenne Mountain Upgrade (CMU) program must meet Joint Chiefs of Staff (JCS) requirements to provide the National Command Authorities with timely, reliable, and unambiguous Integrated Tactical Warning/Attack Assessment (TW/AA) data for force survival or retaliatory decisions in the face of air, space, or ballistic missile threats. These six acquisitions provide: 1) survivable communications access for missile attack warning, 2) integrated warning of ballistic missile, atmospheric, and space threats, 3) standard user displays/warning processing systems at selected command centers, and 4) an austere alternate facility capable of early/trans-attack warning correlation and peacetime backup to the North American Aerospace Defense (NORAD) command center at Cheyenne Mountain.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Command Center Processing and Display System-Replacement (CCPDS-R) Common Subsystem began interface tests with Communications System Segment Replacement (CSSR). CCPDS-R's Processing and Display Subsystem (PDS) began Development Test and Evaluation).
- (U) Space Defense Operations Center (SPADOC) Phase 4C contract was awarded.
- (U) CSSR continued cutover of a 1000 voice and data circuits from the old CSS.
- (U) Survivable Communications Integration System (SCIS) continued porting and software redesign on new hardware.
- (U) Granite Sentry developed and delivered NORAD Weather Support Unit support
- (U) Alternate Processing and Correlation Center (APCC) awarded CSSR equipment contract. US Strategic Command used facility in interim.

2. (U) FY 1993 Planned Program:

- (U) CCPDS-R Common Subsystem conduct DT&E/OT&E at Cheyenne Mountain.
- (U) CSSR begin interface testing with SCIS, CCPDS-R, and Granite Sentry.
- (U) SPADOC 4C will deliver software Version 1.
- (U) CSSR and CCPDS-R begin installation and checkout at APCC.

3. (U) FY 1994 Planned Program

- (U) Command Center Processing & Display System-Replacement (CCPDS-R) Common Subsystem full-up missile warning end-to-end processing test.
- (U) CCPDS-R SAC-Unique Subsystem begin Operational Test and Evaluation (OT&E).
- (U) Granite Sentry deliver NORAD Battle Staff Support Center (BSSC) at Cheyenne Mountain. Begin air warning/command center installation at APCC.
- (U) Communications System Segment Replacement (CSSR) conduct Granite Sentry and Space Defense Operations Center (SPADOC) Phase 4 interface testing.
- (U) Survivable Communications Integration System (SCIS) and CCPDS-R Processing and Display Subsystem (PDS) begin installation/checkout at 23 sites.

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Program Element: #0305906F
PE Title: NCMC-TW/AA Systems

Project Number: 3880
Budget Activity: #3 - Strategic Programs

4. (U) Program to Completion:

- (U) Granite Sentry and SPADOC 4 achieve Initial Operations Capability (IOC) at Cheyenne Mountain.
- (U) Granite Sentry begin OT&E at Alternate Processing and Correlation Center
- (U) Complete installation/checkout of all SCIS and CCDPS-R PDS equipment.
- (U) Conduct end-to-end tests of air and space attack warning processing upgrades.
- (U) Complete Granite Sentry OT&E at APCC.
- (U) Conduct full-up end-to-end test of CMU's integrated air/space/missile attack warning capabilities to demonstrate Full Operational Capability (FOC) in first quarter FY 1996.
- (U) Conduct extensive post-test analysis and correct all significant deficiencies.

D. (U) Work Performed By: CMU program is managed by Air Force Material Command's Electronic Systems Center (ESC), Hanscom AFB, MA. CMU prime contractors, by system, are 1) SCIS: E-Systems, St. Petersburg, FL; 2) CSSR: GTE, Waltham, MA; 3) SPADOC 4C: LORAL C2 Systems, Colorado Springs, CO; 4) CCPDS-R: TRW, Redondo Beach, CA; 5) Granite Sentry: Martin Marietta, Denver, CO (technical software support) and EC, Colorado Springs, CO (hardware). ESC manages delivery of CMU systems to Alternate Processing and Correlation Center facility at Offutt AFB, NE. MITRE, Bedford, MA, and CTA, Colorado Springs, CO, provide technical system engineering and integration support.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: AF Program Executive Officer determined SCIS had to change hardware to meet threat requirement changes and reduce life cycle costs.
2. (U) SCHEDULE CHANGES: Survivable Communications Integration System (SCIS) hardware change delayed its Initial Operations Capability (IOC) from FY94 to FY95.
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

- (U) JCSM 395-86, Update of the Tactical Warning and Attack Assessment Information Requirements of the Joint Chiefs of Staff, 7 Jul 86 (S).
- (U) AFSPACECOM Systems Operational Requirements Document (SORD) 003-84- I/II/III for Cheyenne Mountain Upgrade (CMU) Program, revised 6 Mar 92 (U).
- (U) Program Management Directive 9247(4)/PE12310F, Cheyenne Mountain Upgrade (CMU) Program, 9 Apr 92 (U).

G. (U) RELATED ACTIVITIES:

- (U) PE # 0305909F, Ballistic Missile Early Warning System (BMEWS) Modernization.
- (U) PE # 0305912F, Sea-Launched Ballistic Missile (SLBM) Warning Radar Systems.
- (U) PE # 0305911F, Defense Support Program (DSP).
- (U) There is no unnecessary duplication of effort within the AF or the DoD. Air Force is acquiring the CMU program to meet Joint Chiefs of Staff requirements. JCS has not identified a need for a Joint Service/Panel to coordinate AF activities. The Joint Potential Designator (JPD) does not apply.

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Program Element: #0305906F
PE Title: NCMC-TW/AA Systems

Project Number: 3880
Budget Activity: #3 - Strategic Programs

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Procurement (BA #3, P-1 Line Number 3160):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	20,408	32,770	18,047	Cont*	Cont*

*NOTE: FY 1994-99 does not include current Cheyenne Mountain systems support funding. This does include CMU program-specific sustaining engineering and initial spares funding.

- (U) Military Construction: Completed in FY 1990. There are MILCON funds within this program element, but they are not programmed for use by this project.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|---|-----------------|
| 1. (U) CSSR (CMU interfaces) IOC | 4th Qtr FY 1994 |
| 2. (U) CCPDS-R (all three subsystems) IOC | 1st Qtr FY 1995 |
| 3. (U) SPADOC 4 (all phases) IOC | 4th Qtr FY 1995 |
| 4. (U) Granite Sentry/SCIS/APCC IOC | 1st Qtr FY 1996 |
| 5. (U) CMU FOC | 1st Qtr FY 1996 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems

Project Number: 3881
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
Integrated TW/AA System	9,200	10,284	10,692	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project was set up in 1989 when Air Force recognized the phased transition of Cheyenne Mountain Upgrade (CMU) program into the Integrated Tactical Warning/Attack Assessment network could only be achieved through rigorous system-of-systems design and engineering analysis of all interfaces and relationships among the twenty-eight systems of the network. This project provides for interface analysis and disconnect resolution between CMU and over twenty other Integrated TW/AA systems and program upgrades as required to support the Integrated TW/AA network's continually evolving system-of-systems architecture. It will continue after CMU is complete, to support the addition of new TW/AA systems (e.g., Improved Space-based TW/AA System) and changes driven by new missions/threats (e.g., National Missile Defense).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Developed CMU systems security architecture, functional operational description, and assessed automated architecture management models.
- (U) Continued assessment and disconnect resolution between CMU and other Integrated TW/AA systems and installation design for Offutt AFB, NE.
- (U) Supported CMU preparation for Defense Acquisition Board (DAB) review.

2. (U) FY 1993 Planned Program:

- (U) Provide systems engineering and integration support between CMU systems and the Integrated TW/AA network.
- (U) Analyze and resolve test deficiencies from Communications System Segment Replacement (CSSR) interface testing with CMU & Integrated TW/AA systems.

3. (U) FY 1994 Planned Program:

- (U) Provide systems engineering support during Development Test and Evaluation (DT&E)/Operational T&E (OT&E) for CMU major system deliveries.

4. (U) Program to Completion:

- (U) This is a continuing project, as described above, as long as integrated attack warning is required by the National Command Authorities. After CMU Full Operational Capability (FOC), this project will continue to provide systems engineering support for integration of upgraded or new upgrade programs that must interface with the Integrated Tactical Warning and Attack Assessment (TW/AA) Network.
- (U) Provide systems engineering and integration support between CMU systems and the Integrated TW/AA network.

D. (U) Work Performed By: This project is managed by Air Force Material Command's Electronic Systems Center (ESC), at Hanscom AFB, MA. ESC integrates the Cheyenne Mountain Upgrade (CMU) systems and other Integrated Tactical Warning and Attack Assessment (TW/AA) systems into Cheyenne Mountain AFB, the Alternate Processing and Correlation Center (APCC) facility at Offutt AFB, NE, and selected other command

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Program Element: #0305906F
PE Title: NCMC-TW/AA Systems

Project Number: 3881
Budget Activity: #3 - Strategic Programs

centers. MITRE, Bedford, MA, and CTA, Colorado Springs, CO, provide technical system engineering and integration support to ESC.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not applicable.
2. (U) SCHEDULE CHANGES: Not applicable.
3. (U) COST CHANGES: Not applicable.

F. (U) PROGRAM DOCUMENTATION:

- (U) JCSM 395-86, Update of the Tactical Warning and Attack Assessment Information Requirements of the Joint Chiefs of Staff, 7 Jul 86 (S).
- (U) AFSPACOM Systems Operational Requirements Document (SORD) 003-84- I/II/III for Cheyenne Mountain Upgrade (CMU) Program, revised 6 Mar 92 (U).
- (U) Program Management Directive 9247(4)/PE12310F, Cheyenne Mountain Upgrade (CMU) Program, 9 Apr 92 (U).

G. (U) RELATED ACTIVITIES:

- (U) PE # 0305909F, Ballistic Missile Early Warning System (BMEWS) Modernization.
- (U) PE # 0305912F, Sea-Launched Ballistic Missile (SLBM) Warning Radar Systems.
- (U) PE # 0305911F, Defense Support Program (DSP).
- (U) There is no unnecessary duplication of effort within the AF or the DoD. Air Force is acquiring the CMU program to meet Joint Chiefs of Staff requirements. JCS has not identified a need for a Joint Service/Panel to coordinate AF activities. The Joint Potential Designator (JPD) does not apply.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305910F
PE Title: SPACETRACK

Budget Activity: #3-Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2295 Space Surveillance Network Improvement Program	4,506	17,616	19,412	TBD	TBD
2296 Space Surveillance System Development	1,000	2,111	2,325	11,625	17,165
3887 Space Control Support	4,775	7,290	3,818	0	28,644
4239 Air Force Maui Optical Station	4,950	5,100	5,335	Cont	TBD
4241 Advanced Electro-Optical System	0	39,385	0	25,089	80,600
4279 HAVE STARE Radar	0	0	14,340	33,000	64,000
Total	34,231	71,502	45,246	Cont	TBD

(Note: FY 92 and prior year funding was in PE 0102424F, PE number change only)

- B. (U) BRIEF DESCRIPTION OF ELEMENT: SPACETRACK is a worldwide space surveillance network (SSN) of dedicated, collateral, and contributing optical, electro-optical, passive RF and radar sensors. The SSN is tasked to provide space object cataloging and identification, satellite attack warning, timely notification to US forces of satellite flyover, space treaty monitoring, and scientific and technical intelligence gathering. The continued increase in the satellite and orbital debris populations, as well as the increased use of different launch trajectories, non-standard orbits, and geosynchronous altitudes, necessitates upgrades to detection and tracking sensors to meet existing and future requirements. In addition, most SSN elements require upgrades to ensure supportability due to their age. SPACETRACK would provide the systems development and modifications necessary for command and control, targeting, and damage assessment for the US Antisatellite (ASAT) system. The Image Information Processing Center and computing facility upgrade for the Air Force Maui Optical Station (AMOS) was transferred to PE 62601F in FY 92. The HAVE STARE Radar development was transferred to SPACETRACK from the original intelligence program per Congressional direction in FY93.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:1. (U) Project 2296 Space Surveillance Systems Development:

Provides for the evaluation of potential space based sensor contributions to the missions of the SSN. Evaluates potential operations concepts of space based sensors. Program is developing a ground-based computer system to process space surveillance data from SDIO's Space Based Visible (SBV) experiment to be launched on the Midcourse Space Experiment (MSX).

(U) FY 1992 Accomplishments:

- (U) Completed preliminary design for the ground processing system to use SDIO's SBV experiment data to evaluate space based sensor technologies and concepts for space surveillance.

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Program Element: #0305910F

Budget Activity: #3-Strategic Programs

PE Title: SPACETRACK

- (U) FY 1993 Planned Program:
 - (U) Continue fabrication, integration, and test of SBV ground processing system.
- (U) FY 1994 Planned Program:
 - (U) Continue integration and test of the ground processing system.
- (U) Work Performed By: Space and Missile Systems Center (SMC), Los Angeles AFB, CA manages this project. Systems engineering and technical support is provided by Aerospace Corporation, Los Angeles, CA.
- (U) Related Activities:
 - (U) PE #0102310F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Not applicable.
- (U) International Cooperative Agreements: Not applicable.
- 2. (U) Project 3887 Space Control Support - ASAT BM/C3 and Surveillance:

Foreign space systems represent a continuing threat to US land, naval, and aerospace forces. The US space control objectives are to guarantee free access to space in peace and deny an adversary's use or control of space in war. The DOD's ASAT program protects the option to pursue deployment of an ASAT capability if directed. The Air Force is lead for the overall ASAT system architecture, end-to-end operational test, and developing and fielding the Battle Management/C3 (BM/C3) system. The current program does not include fielding an ASAT system. The BM/C3 contractor will design and document the ASAT architecture, interfaces, and top level specifications. The contractor will also perform a preliminary design of the BM/C3 system to identify critical or high risk functions and interfaces.
- (U) FY 1992 Accomplishments:
 - (U) Restructured program to be consistent with the Army's Kinetic Energy (KE) ASAT weapon program.
 - (U) Awarded Air Force BM/C3 contract in May 92. Initiated ASAT architecture design and preliminary BM/C3 system design.
- (U) FY 1993 Planned Program:
 - (U) Continue ASAT architecture design to support ASAT System Design Review in 4Q FY 93.
 - (U) Deleted prototyping of critical/high risk BM/C3 functions because of Congressional budget cut.
- (U) FY 1994 Planned Program:
 - (U) Complete architecture design to support Defense Acquisition Board Level program review in 4Q FY 94.
- (U) Work Performed By: Electronic Systems Center, Hanscom AFB, MA manages the ASAT BM/C3 program. Prime contractor is TRW, Carson, CA. Systems engineering and technical support is provided by Mitre Corp, Bedford MA; and CTA, Bedford, MA.
- (U) Related Activities:
 - (U) PE #0102310F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System.
 - (U) PE #0603393A, Kinetic Energy ASAT Program.
 - (U) PE #0603508F, Advanced Weapons Technology
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0305910F
PE Title: SPACETRACK

Budget Activity: #3-Strategic Programs

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 4239 Air Force Maui Optical Station:

The Air Force Maui Optical Station (AMOS) is a unique national R&D facility that provides measurement support to government and scientific communities, serves as a test bed for electro-optics and imaging technology, and supports operational space surveillance requirements. Part of the basic operations and support funding for AMOS is provided through this project. Outside user support through other development,

measurement and experimental programs from various sources (e.g. SDIO, Intelligence, etc.) provides the balance of the funding. In addition to its primary R&D missions, this site provides critical operational data to Space Command: infrared signature data and compensated imaging data used for space object identification and mission/payload assessment. The Image Information Processing and Computer Center (IIPCC) program was transferred to PE 62601F per Congressional direction. Accomplishments and plans will be addressed by that PE.

(U) FY 1992 Accomplishments:

- (U) Continued basic core funding for AMOS site operations.
- (U) Implemented new high resolution imaging system to provide upgraded operational capability.
- (U) Initiated IIPCC program procurement activities. FY 92 appropriation fully funds FY92 and FY93 program. Transferred program to PE 62601F.

(U) FY 1993 Planned Program:

- (U) Continue basic core funding for AMOS site operations.
- (U) Recoat the 1.6 meter primary mirror.

(U) FY 1994 Planned Program:

- (U) Continue basic core funding for AMOS site operations.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM manages the operation of the AMOS facility and conducts research and development at AMOS. Rockwell Power Systems, Albuquerque, NM operates the AMOS facility.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 4241 Advanced Electro-Optical System:

The Advanced Electro-Optical System (AEOS) is a 3.67 meter telescope upgrade for the AMOS and would replace the existing 1.6 meter telescope. The AEOS program was initiated in FY91 per Congressional direction. Funding to continue the program in FY93 was also directed by Congress. FY93 appropriation will partially fund the program in FY94. Additional funding in FY94 and beyond, required to complete AEOS is not requested.

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Program Element: #0305910F
PE Title: SPACETRACK

Budget Activity: #3-Strategic Programs

(U) FY 1992 Accomplishments:

- (U) Awarded the AEOS telescope contract in Dec 91. Successfully completed preliminary design review. Obtained 3.67 meter mirror blank from cancelled Army research program. Completed site selection. Initiated facility design and environmental reports.

(U) FY 1993 Planned Program:

- (U) Complete facility design.
- (U) Initiate adaptive optics design.
- (U) Complete telescope CDR.
- (U) Initiate short wavelength infrared spectrograph design per Congressional direction.

(U) FY 1994 Planned Program:

- (U) Continue program until FY93 funding is exhausted.

- (U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM manages the AEOS development. Contraves USA, Pittsburgh, PA is contracted to deliver the AEOS telescope.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305910F
PE Title: SPACETRACK

Project: #2295
Budget Activity: #3-Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Ground Based System Improvements	4,506	16,673	19,424	TBD	TBD

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Space surveillance provides space object cataloging and identification and supports the Space Defense missions of weapons support, attack warning for US satellites, maintenance of space order of battle, cover-up alerts, and identification/assessment of space objects. The Space Surveillance Network Improvement Program (SSNIP) develops and implements upgrades and improvements to the SSN to correct identified deficiencies in support of those mission requirements. SSNIP also implements upgrades required for supportability/maintainability. SSNIP efforts include improvements to the Ground-based Electro-Optical Deep Space Surveillance System (GEODSS), reducing uncorrelated target (UCT) errors, orbital debris research and measurement, communications/data link improvements, dedicated sensor upgrades, and system architecture analyses.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed study to identify deep space surveillance alternatives to eliminate GEODSS coverage gap and improve its supportability.
- (U) Continued operation of the GEODSS Engineering Test Site (ETS). The ETS will be used as a test bed for the GEODSS modifications or improvements.
- (U) Continued orbital debris research and measurement to characterize space debris environment and develop models to predict the "unmeasurable" environment (i.e debris too small to be tracked reliably).
- (U) Completed study to identify and correct sources of false UCT errors for the Eglin radar.
- (U) Completed systems engineering effort to define required sensor improvement programs for FY 1993 implementation. Studies included alternatives to improve and optimize the existing near earth surveillance systems.
- (U) Incorporated program to complete construction of the Haystack Auxiliary (HAX) radar, originally funded by NASA. This adjunct radar will provide the DOD with improved satellite imaging capability on a much more timely basis.

2. (U) FY 1993 Planned Program:

- (U) Award contract to design, develop, and deploy hardware and software to upgrade the GEODSS. This upgrade will enable performance improvements to allow 3 sites to provide worldwide coverage, allow O&M cost reductions by reducing the number of sites and consolidating operations. The program will replace the aging computer system, replace the sensor, develop remote operations capability, and enable the non-CONUS sites to be relocatable should the need arise.
- (U) Complete the orbital debris measurement task and perform an analytical task to model and assess orbital debris effects on SSN and space system performance. Produce SSN improvement recommendations and spacecraft design guidelines.
- (U) Implement the UCT study results at the Eglin radar.
- (U) Start developing astrodynamic standards to improve accuracy of orbital element data, improve consistency between sensors, and correct basic inadequacies of existing models for non-standard orbits.

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Program Element: #0305910F
PE Title: SPACETRACK

Project: #2295
Budget Activity: #3-Strategic Programs

- (U) Initiate effort to improve accuracy of the star catalog data base to support electro-optical sensors.
 - (U) Complete HAX radar. System will be available to support space surveillance requirements 4QFY93.
3. (U) FY 1994 Planned Program:
- (U) Continue GEODSS upgrade. Begin hardware procurement.
 - (U) Initiate upgrades to the communications/data links of the SSN. These upgrades will provide dedicated, secure voice and data links between SSN elements and the Space Surveillance Center in Cheyenne Mountain (and its alternate), as well as improve overall data flow capacity.
 - (U) Continue astrodynamic standards and star catalog improvements.
 - (U) Complete improvement to Millstone radar to better enable detection of anomalies (changes) in geostationary spacecraft.
4. (U) Program to Completion:
- (U) Complete GEODSS upgrade in FY97.
 - (U) This is a continuing program. As space surveillance deficiencies are identified and validated, funding is programmed.
- D. (U) Work Performed By: Electronic Systems Center, Hanscom AFB, MA manages SSNIP. Contractors are TRW, Redondo Beach, CA; SENCOM Corp., Bedford, MA; and Rockwell Power Systems, Albuquerque NM. MIT/Lincoln Laboratories is fielding the HAX radar. TRW, Redondo Beach, CA will perform the GEODSS upgrade. Systems engineering and technical support is provided by MIT Lincoln Laboratory, Lexington, MA; Mitre Corp, Bedford MA; CTA, Bedford, MA; ARE, Bedford, MA; and Aerospace Corp, El Segundo, CA.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: Due to FY93 Congressional reduction, upgrades to reduce the false uncorrelated error rates of various sensors was descope to only upgrades for the Eglin radar. The scope of the orbital debris measurement program was also decreased, reducing our measurement's confidence level.
 2. (U) SCHEDULE CHANGES: The Congressional reduction delayed upgrades to SSN communications/data links by 1 year, delayed completion of astrodynamic standards implementation by 1 year, delayed completion of star catalog upgrade by 2 years.
 3. (U) COST CHANGES: None.
- F. (U) PROGRAM DOCUMENTATION:
- (U) AFSPACECOM SON 02-88, Space Surveillance, 13 Nov 89 (Secret).
 - (U) AFSPACECOM SON 014-89, Space Object Identification, 6 May 91 (Secret).
 - (U) USSPACECOM MNS 89-001, Dedicated Satellite Radar Imaging Capability (Secret).
 - (U) Space Surveillance Network Improvement Program, PMD 7264(5), 29 Aug 91.
 - (U) Mission Need Statement (MNS) Space Control Anti-Satellite Capability, 19 May 88 (Secret).
- G. (U) RELATED ACTIVITIES:
- (U) PE #0102310F (Cheyenne Mountain Complex Tactical Warning/Attack Assessment System).
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0305910E
 PE Title: SPACETRACK

Project: #2295
 Budget Activity: #3-Strategic Programs

(U) Other Procurement					
	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Spares	0	577	104	Cont	TBD
Space Mods	<u>3,507</u>	<u>6,949</u>	<u>14,071</u>	<u>Cont</u>	<u>TBD</u>
Total	<u>3,507</u>	<u>7,526</u>	<u>14,121</u>	<u>Cont</u>	<u>TBD</u>

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.
- J. (U) MILESTONE SCHEDULE: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305910F

Project: #4279

PE Title: SPACETRACK

Budget Activity: #3-Strategic Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
HAVE STARE Radar	0	0	14,340	49,000	63,340

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The HAVE STARE (HS) radar was transferred from the intelligence budget in FY93 at the direction of Congress. The Air Force has identified a requirement for the HS system and has programmed funding in this program element to complete development and to deploy the system. HS is a high resolution X-band tracking and imaging radar with a 27 meter mechanical dish antenna. HS will be deployed as a dedicated space surveillance sensor to support the mission of space object catalog maintenance of deep space objects and mission payload assessment. The potential to support other missions is also being evaluated. HS will be used to replace the A final deployment location has not been determined. It will provide both an improvement in capability and a reduction in overall SPACETRACK O&M costs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments:

- (U) Completed hardware Critical Design Review.
- (U) Completed system Critical Design Review
- (U) Completed software Preliminary Design Review
- (U) Completed facility design.

2. (U) FY 1993 Planned Program:

- (U) Complete software Critical Design Reviews.
- (U) Complete radar hardware fabrication.
- (U) Complete radar test facility at Vandenberg AFB, CA.
- (U) Install antenna at Vandenberg AFB, CA.
- (U) Begin in-plant hardware/software integration.

3. (U) FY 1994 Planned Program:

- (U) Select final operational deployment location.
- (U) Complete software Formal Qualification Testing.
- (U) Complete in-plant hardware/software integration.
- (U) Begin developmental test and evaluation at Vandenberg AFB, CA.
- (U) Begin facility design for final deployment location.
- (U) Begin incorporation of functionality and connectivity modifications required for integration with the Space Surveillance Network.

4. (U) Program to Completion:

- (U) Deploy system to final location.
- (U) Conduct system IOT&E.
- (U) IOC in FY 1997.

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Program Element: #0305910E
PE Title: SPACETRACK

Project: #4279
Budget Activity: #3-Strategic Programs

- D. (U) Work Performed By: Electronic Systems Center, Hanscom AFB, MA manages HS. Prime contractor is Raytheon Co. Wayland MA. Systems engineering and technical support is provided by Mitre Corp, Bedford MA; Riverside Research Institute, Lexington MA; and The Ultra Corporation, Lexington, MA.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: None.
 2. (U) SCHEDULE CHANGES: None.
 3. (U) COST CHANGES: None.
- F. (U) PROGRAM DOCUMENTATION:
- (U) AFSPACECOM SON 02-88, Space Surveillance, 13 Nov 89 (Secret).
 - (U) AFSPACECOM SON 014-89, Space Object Identification, 6 May 91 (Secret).
 - (U) USSPACECOM MNS 89-001, Dedicated Satellite Radar Imaging Capability (Secret).
 - (U) Space Surveillance Network Improvement Program, PMD 7264(5), 29 Aug 91.
 - (U) AFSPACECOM SON 004-88, Deep Space Surveillance Radar (Eastern Hemisphere), 13 Nov 89 (Secret).
- G. (U) RELATED ACTIVITIES:
- (U) PE #0102310F (Cheyenne Mountain Complex Tactical Warning/Attack Assessment System).
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): None.
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.
- J. (U) MILESTONE SCHEDULE:
- | | |
|-------------------------|------|
| - (U) Begin DT&E | FY94 |
| - (U) Select Final Site | FY94 |
| - (U) Begin IOT&E | FY96 |
| - (U) IOC | FY97 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305911FProject: 3624PE Title: Space ActivitiesBudget Activity: #3 - Strategic ProgramsA. (U) RESOURCES: (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
Defense Support Program (DSP)	51,141*	49,081	66,777	Cont	TBD

* Previously funded in PE #0102431F.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The DSP system provides a spaced-based surveillance system to detect and report missile and space launches and nuclear detonations in near real time during pre-, trans-, and post-attack periods. The DSP system consists of a constellation of satellites in geostationary orbits, fixed and mobile ground processing stations, one multi-purpose facility, and a ground communications network (GCN). DSP's primary mission is to provide tactical warning and limited attack assessment of a ballistic missile attack. DSP also detects and reports nuclear detonation events. This program element provides funding for development to modernize ground stations to ensure continued operability and integrate satellites to launch vehicles, procurement of satellites and ground station hardware, and operation of the DSP ground stations.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:
 - (U) Launched DSP-16 from the Space Shuttle, demonstrating dual launch capability and assured access to space.
 - (U) Continued development to replace fixed ground station software architecture to complement new satellite capabilities (e.g. stereo processing, laser crosslink data processing, processing new sensor data, Ada-based language), and software maintenance and support programs. Continued software coding.
 - (U) Continued development to replace overloaded computers at the fixed ground stations. Completed qualification testing.
 - (U) Continued development for mobile ground station hardware and software upgrades. Upgrades complete on mobile terminals #3 and #4.
 - (U) Continued the development to replace unsupportable satellite readout equipment at the fixed ground stations. Continued qualification testing.
2. (U) FY 1993 Planned Program:
 - (U) Development to replace fixed ground station software terminated.
 - (U) Development to replace overloaded computers at the fixed ground stations terminated due to System 1 software termination.
 - (U) Complete development for mobile ground station hardware and software upgrades. Complete upgrades for mobile terminals #5 and #6.
 - (U) Continue development to replace unsupportable satellite readout equipment at the fixed ground stations. Complete installation and checkout at first site.
3. (U) FY 1994 Planned Program:
 - (U) Begin development to replace fixed ground station software. Award contract to upgrade current software.
 - (U) Begin development to replace overloaded computers at the fixed ground stations. Complete installation and checkout at first ground station along with new software.
 - (U) Award contract for computers compatible with current software.
 - (U) Continue development to replace unsupportable satellite readout equipment at the fixed ground stations. Complete installation and checkout for second ground station.
 - (U) Increase in funding level is due to an increase in software development costs.
4. (U) Program to Completion:
 - (U) This is a continuing program until replaced by the Improved Space Based TW/AA (ISBTW/AA), aka FEWS program.

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Program Element: 0305911F
 PE Title: Space Activities

Project: 3624
 Budget Activity: #3 - Strategic Programs

- (U) Continue development to upgrade fixed ground station software.
 - (U) Continue development to replace overloaded computers at the fixed ground stations. Complete installation and checkout at second ground station along with new software.
 - (U) Complete development to replace unsupportable satellite readout equipment at the fixed ground stations.
 - (U) Complete installation and checkout of third ground station.
 - (U) Emphasis directed toward eliminating/minimizing operational deficiencies and vulnerabilities, maintaining on-orbit satellite constellation by satellite procurements and launches, insuring timely and accurate system performance, and insuring the supportability of the DSP ground system.
 - (U) Plan and execute the transition to the ISBTW/AA.
- D. (U) Work Performed By: The Program Executive Officer (PEO) for Space is responsible for system development and acquisition. The major contractors are TRW, Redondo Beach, CA; Aerojet Electronic Systems Division, Azusa, CA; IBM, Boulder, CO; Aerospace Corp., El Segundo, CA; Sandia National Laboratories, Albuquerque, NM; and Los Alamos National Laboratories, Los Alamos, NM.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES
1. (U) TECHNICAL CHANGES: Due to cost increases and schedule delays, System 1 software was terminated. The revised plan is to award contracts in FY 94 to upgrade current software to provide similar capabilities and for computers compatible with the existing software.
 2. (U) SCHEDULE CHANGES: Delivery of System 1 Software was delayed from Jun 93 to Jun 94 due to developmental delays by the contractor. As a result, this project was terminated.
 3. (U) COST CHANGES: The contractor estimate-at-completion for System 1 Software has grown from \$129M to \$202M. As a result of cost and schedule changes, the System 1 Software project was terminated in December 1992.
- F. (U) PROGRAM DOCUMENTATION:
- (U) DepSecDef memo to SecAF, DSARC I for Advanced Warning Systems (S), 15 Feb 80.
 - (U) SecDef memo to SecAF, MENS for Improved Missile Warning and Attack Assessment (S), 19 Mar 80.
 - (U) DSP System Operational Concept (SOC) (S), 1 Dec 87.
- G. (U) RELATED ACTIVITIES:
- (U) PE #0102431F (Defense Support Program).
 - (U) PE #0604325F/0305905F (Advanced Warning System/ISBTW/AA).
 - (U) PE #0603735F/0303605F (Defense Satellite Communications System/Satellite Communications Terminals).
 - (U) PE #0303601F (Milstar AF Terminals).
 - (U) PE #0305144F/0305171F/0305138F (Titan Space Boosters/Space Launch Support/Upper Stages Program).
 - (U) PE #0102310F/0102313F (Cheyenne Mountain Upgrade Programs/Integrated TW/AA System).
 - (U) PE #0305110F (AF Satellite Control Network).
 - (U) PE #0604766A (Tactical Electronic Surveillance System).
 - (U) There is no unnecessary duplication of effort within the AF or the DOD.
- H. (U) OTHER APPROPRIATION FUNDS:
- (U) Missile Procurement (BA 45)
- | | FY 1992
<u>Actual</u> | FY 1993
<u>Estimate</u> | FY 1994
<u>Estimate</u> | To
<u>Complete</u> | Total
<u>Program</u> |
|------------|--------------------------|----------------------------|----------------------------|-----------------------|-------------------------|
| Cost | 64,386* | 286,694 | 459,143 | Cont | TBD |
| Qty (sats) | 0 | 0 | 1 | 1 | 25 |
- (U) Other Procurement (BA 63 plus initial spares)
- | | FY 1992
<u>Actual</u> | FY 1993
<u>Estimate</u> | FY 1994
<u>Estimate</u> | To
<u>Complete</u> | Total
<u>Program</u> |
|------|--------------------------|----------------------------|----------------------------|-----------------------|-------------------------|
| Cost | 58,018* | 55,342 | 39,479 | Cont | TBD |
- * Previously funded in PE #0102431F.

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Program Element: 0305911F
PE Title: Space Activities

Project: 3624
Budget Activity: #3 - Strategic Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MAJOR MILESTONES:

- | | |
|---|---------|
| 1. (U) Complete upgrades to Mobile Ground System | FY 1993 |
| 2. (U) Complete Satellite Readout Station Upgrade | FY 1995 |
| 3. (U) Complete Ground Computer Changeout | FY 1996 |
| 4. (U) Complete System 1 Software | FY 1996 |

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FY 1994 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305913F

Budget Activity: #3-Strategic Programs

PE Title: Nuclear Detonation (NUDET)
Detection System (NDS)A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
NDS					
2124	0**	2,153	0	Cont	TBD
Nuclear Detonation Detection System (Data Processing)					
2808	6,812*	4,897	9,359	Cont	TBD
Nuclear Detonation Detection System (Sensors)					
Totals	6,812	7,050	9,359	Cont	TBD

* Funded in PE 012433F in FY92 and prior.

** Funded in PE 0301357F in FY 93 and prior.

- B. (U) BRIEF DESCRIPTION OF ELEMENT: The National Command Authorities require a highly survivable capability to detect, locate, and report any nuclear detonation (NUDET) on a global basis in near real time. The NUDET Detection System consists of sensors integrated on the operational Navstar Global Positioning System (GPS) satellites plus a user segment consisting of Ground NDS Terminals (GNTs). The GPS/NDS satellite payload consists of X-ray, optical, and electromagnetic pulse (EMP) sensors. These sensors, when coupled with the extremely precise GPS timing capability, will provide location of nuclear bursts worldwide with an accuracy of 100 meters. These data are crosslinked to other GPS/NDS satellites to provide worldwide connectivity. A broad range of users (National Command Authorities, Strategic Command, US Space Command) receive NUDET data, direct from the spacecraft, on the precise location, yield, count, time, and height of burst.

These activities were formally covered under

Program Elements 0102433F and 0301357F

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:1. (U) Project Number 2124. Nuclear Detonation Detection System (NDS):

This program funds development/integration of the data crosslink and downlink and integration of sensors and NDS processors on the GPS spacecraft. This program complements Project number 2808 which develops and procures EMP sensors for GPS satellites and develops NDS ground terminal prototypes.

(U) FY 1992 Accomplishments:

- (U) Continued engineering development of sensor integration design for GPS Block IIR satellites.
- (U) Qualified the Block IIR NDS satellite crosslink and downlink design.
- (U) Transferred \$1.5M to a Defense Intelligence Agency Program Element (PE). Funds still available to the NDS program, but under this DIA PE.

(U) FY 1993 Planned Program:

- (U) Complete development and qualification of integrated NDS hardware systems into Block IIR spacecraft.
- (U) Complete the Block IIR NDS satellite crosslink/downlink sys qualification.
- (U) Develop engineering solutions to deficiencies identified during testing.
- (U) GPS/NDS aspects of this project are complete in FY 93.

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Program Element: #0305913F
PE Title: Nuclear Detonation (NUDET)
Detection System (NDS)

Budget Activity: #3-Strategic Programs
Date: February 23, 1992

(U) FY 1994 Planned Program:

- (U) Funds transferred to Project 2808

(U) Work Performed By: System development and procurement is accomplished by AF Materiel Command's Space and Missile Systems Center, Los Angeles AFB, CA with the assistance of the Rockwell International, Seal Beach, CA, integrates the NDS sensors on Block II GPS satellites and produces the EMP sensor for Block II satellites. General Electric, East Windsor, NJ will integrate NDS sensors on Block II replenishment satellites. Sandia National Laboratories, Albuquerque, NM, and Los Alamos National Laboratory, Los Alamos, NM, are under contract to the Department of Energy to produce the X-ray and optical nuclear detonation sensors. E-Systems, Garland, TX, is producing the EMP receiver/processor for the Block II satellites and International Telephone and Telegraph (ITT) Aerospace and Comm Division, Nutley, NJ, is under contract to Sandia National Laboratory to develop the EMP sensor for Block II replenishment satellites.

(U) Related Activities:

- (U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Missile Procurement (BA 5)

	FY 1992 Actual	FY1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost					
Quantities	4	6	6		

(U) International Cooperative Agreements: Not applicable.

2. (U) Project Number 2808, Nuclear Detonation Detection System (NDS): Funds development of the electromagnetic pulse (EMP) sensors and development of the ground terminals. It complements Project number 2124 which provides for the integration of these NDS sensors on GPS spacecraft.

(U) FY 1992 Accomplishments

- (U) Completed design definition of low cost ground NDS terminals.
- (U) Continue engineering development and requalification of NDS sensors for Block IIR satellites.
- (U) Began design to integrate ground terminals in STRATCOM and AFSPACECOM mobile command posts.
- (U) Began production phase of NDS electromagnetic pulse sensor.
- (U) Completed Ground/Airborne Integrated Terminal (G/AIT) contract. All five units placed in storage for contingency use.
- (U) Began performance testing for Block IIR satellite NDS EMP sensor.

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Program Element: #0305913F
PE Title: Nuclear Detonation (NUDET)
Detection System (NDS)

Budget Activity: #3-Strategic Programs

(U) FY 1993 Planned Program:

- (U) Initiate fabrication of ground terminal prototypes.
- (U) Complete GNT critical design review.
- (U) Complete integration design for ground terminals in mobile command posts. Fabricate required integration hardware and software.
- (U) Begin installing ground terminals in STRATCOM and AFSPACECOM mobile cmd posts.
- (U) Complete EMP sensor performance testing and final design review.

(U) FY 1994 Planned Program:

- (U) Complete equipment installation and begin prototype testing of the GNT.
- (U) Begin GNT software change required to support Block IIR satellite.

(U) Program to Completion:

- (U) Complete NDS sensor qualification for Block IIR satellite.
- (U) Complete GNT prototype test and install initial GNT Block IIR software upgrade.
- (U) Continue GNT Block IIR software modification development.

- (U) Work Performed By: System development and procurement is accomplished by the AFMC's Space and Missile Systems Center, Los Angeles AFB, CA aided by Rockwell International, Seal Beach, CA, integrates the NDS sensors on Block II GPS satellites and produces the EMP sensor for Block II. General Electric, East Windsor, NJ will integrate NDS sensors on Block II replenishment satellites. The Aerospace Corporation, El Segundo, CA, provide systems support. Sandia National Laboratories, Albuquerque, NM, and Los Alamos National Laboratory, Los Alamos, NM, are under contract with DOE to produce the X-ray and optical nuclear detonation sensors. Texas Instruments, Dallas, TX, developed the G/AIT. Sandia National Labs will develop the NDS Ground Terminal prototypes. E-Systems, Garland, TX and International Telephone and Telegraph Aerospace and Communications Division, Nutley, NJ, are under contract to Sandia National Laboratory to develop the electromagnetic pulse sensor for Block II replenishment satellites.

(U) Related Activities:

- (U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.
-
- (U) PE 0305999F, Data Analysis.
- (U) There is no unnecessary duplication of effort within the AF or the DoD.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Missile Procurement (BA 27, P-44/45)

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost					
Quantities	4	4	4	Cont	TBD

- (U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0401218F

Budget Activity: #3 Strategic Programs

PE Title: KC-135 Squadrons

A. (U) RESOURCES (\$ In Millions)

Project Number & Title	FY 1992* Actual	FY1993* Estimate	FY1994 Estimate	To Complete	Total Program
#2214 Improved Air Refueling System (IARS)	5,730	3,499	3,441	NA	NA
#4285 Receptacle Modification	0.0	0.0	6,214	0.0	6,214
#4286 Multipoint Modification	0.0	0.0	11,156	42,744	53,900
	5,730	3,499	20,811	42,744	60,114

* Funding prior to FY94 is in PE 11142F

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES

This program element contains three efforts. The Improved Air Refueling System (IARS) program is an on-going effort which identifies air refueling system deficiencies and develops alternatives which will correct the deficiencies. The Receptacle modification program is to place receptacles on 150 KC-135R aircraft. The receptacles will increase the flexibility of the tanker and allow for increased off loads at extended ranges. The Multipoint modification program will place two wing mounted air refueling pods on 75 KC-135R aircraft. The refueling pods will provide increased flexibility and enhanced interoperability between U.S. Navy, NATO and allied aircraft.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0M IN FY 1994:

1. (U) #2214: Improved Air Refueling System (IARS)

The Improved Air Refueling System (IARS) is designed to fund several research and development projects that will improve the aerial refueling system of the KC-135 fleet. This requirement was established by SAC Statement of Need (SON) 001-87 which identified several deficiencies in the KC-135 refueling capability. The IARS program is phased to investigate changes to systems to correct deficiencies and improve the overall refueling capability of the aircraft, inter- and intra-service and NATO aerial refueling procedures.

(U) FY 1992 Accomplishments:

- (U) Determine requirements that should be considered in selecting future tanker aircraft
- (U) Conduct evaluations of systems that could improve the cargo carrying capability of the KC-135
- (U) Study improvements that could be made to the air refueling envelope
- (U) Continue the Corrosion Control Study which will identify methods to extend the airframe service life

(U) FY 1993 Planned Program:

- (U) Conduct evaluations of systems that could be considered in selecting future tanker aircraft
- (U) Conduct evaluations of systems that could improve the cargo carrying capability of the KC-135
- (U) Study improvements that could be made to the air refueling envelope
- (U) Evaluate aircraft systems that are candidates for replacement based upon Reliability and Maintainability factors

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Program Element: #0401218F
PE Title: KC-135 Squadrons

Budget Activity: #3 Strategic Programs

- (U) Continue the Corrosion Control Study which will identify methods to extend the airframe service life
- (U) Conduct wing mounted pod design studies and development of prototypes
- (U) Conduct receptacle design studies leading to prototype development

(U) FY 1994 Planned Program:

- (U) Conduct wing mounted pod design studies and development of prototypes
- (U) Conduct DT&E and OT&E on the Improved Boom Nozzle
- (U) Continue the Corrosion Study and identify non destructive investigative techniques
- (U) Continue evaluation of avionics improvements through the crew station evaluation facility
- (U) Study methods to expand boom envelope to include scale model and wind tunnel testing
- (U) Start improved radar, heading system and threat warning system evaluation

(U) Program to Completion:

- (U) This is a continuing effort to correct existing system deficiencies in order to meet the aerial refueling requirements of the next decade

(U) Work Performed By: Work has been performed by the Frontier Technology Inc, Santa Barbara, CA.; Parker Hannifin, Los Angeles, CA.; J.C. Carter Co., Costa Mesa, CA.; Sergeant Fletcher, El Monte, CA.; SAR Industries, City of Industries, CA.; Data Products New England, Inc., Wallingford, CN.; Aeronautical Systems Division; 4950th Test Wing; and 6150 Test Wing.

(U) Related Activities: PE 11142F, KC-135 Squadrons is used prior to FY94

(U) Other Appropriation Funds (\$ in Millions): None

(U) International Cooperative Agreements: None

2. (U) #4285: Receptacle Modification:

Air Force tankers have a mission to extend the range and mission effectiveness of combat, reconnaissance, and airlift forces of all commands and services. KC-135s are used in worldwide deployment and theater employment roles and are capable of delivering fuel to various Air Force, Navy, Marine, NATO, and allied aircraft with minimum reliance on forward basing. The cost of flying hours and fuel used for the tanker dictates that the tanker be utilized in a more efficient manner. Additionally, the questionable availability of forward basing and increased off load demands at extended ranges causes additional tankers to be added for mission success. Refueling can be conducted more efficiently and air campaign tempos stepped up if the KC-135 could provide an air refueling capability of the same off load at extended ranges, and an operational capability to mass fighters in closer waves over a target area. Receptacle equipped KC-135s will provide the benefits of increased off load at extended ranges, increased tanker utilization, reduced reliance on forward basing, and enhanced mission flexibility. The greatest threat to the KC-135 is presented by the long-range components of an integrated air defense system. Long-range fighters provide the first line of active air defense and are the greatest threat. Long-range SAMs, which are an integral part of an air defense system, also pose a serious threat to air refueling aircraft.

(U) FY 1992 Accomplishments:

- (U) None. FY 1994 New Start

(U) FY 1993 Planned Program:

- (U) None. FY 1994 New Start

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Program Element: #0401218F
PE Title: KC-135 Squadrons

Budget Activity: #3 Strategic Programs

(U) FY 1994 Planned Program:

- (U) Complete Life Cycle Cost trade-off study comparing the Boeing and Universal Air Refueling Receptacle Slipway Units
- (U) Prepare Statement of Work and Government Furnished Drawings for Receptacle Modification
- (U) Award contract to Design Engineering Program (DEP) Contractor or 4950th Test Squadron for design, development and prototyping of the Receptacle Modification
- (U) Furnish Receptacle design to Aeronautical Systems Center (ASC) for integration activities with Multipoint modification

(U) Program to Completion:

- (U) Deliver first prototype aircraft in Jun 1995 and the second prototype in Jul 1995. Prototypes to be used by ASC for integration of the Multipoint modification.
- (U) Start draft RFP activities for production phase during Summer of 1995
- (U) Award production contract for modification kits in Sep 1996
- (U) Modification kits installed during scheduled PDM cycle at the rate of 15 aircraft per year starting in Sep 1997. A total of 150 aircraft will be modified by Sep 2007

(U) Work Performed By: The modification effort to be managed by the System Program Manager (SPM) at Tinker AFB, OK. The SPM office symbol is OC-ALC/LAC. The SPM will be assisted by ASC/SDC located at Wright Patterson AFB, OH. ASC/SDC will address integration issues between the Receptacle and Multipoint Air Refueling Modifications. The SPM will contract with one of the OC-ALC Design Engineering Program (DEP) contractors or the 4950th Test Squadron for development of the modification kit. The production contract will be competitively awarded in Sep 1996. The modification will be installed at the depot during the PDM cycle.

(U) Related Activities:

(U) Other Appropriation Funds (\$ in Millions):

(U) Aircraft (3010) Procurement:

<u>FY 1992</u> <u>Actual</u>	<u>FY1993</u> <u>Estimate</u>	<u>FY1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
0.0	0.0	0.0	350.9	350.9

(U) International Cooperative Agreements: None

3. (U) #4286: Multipoint Modification:

The Multipoint Refueling System (MPRS) will permit simultaneous refueling of two probe equipped receivers. The system provides enhanced reliability through redundancy for probe/drogue refueling and allows refueling of probe equipped and receptacle equipped receivers during a single mission (not simultaneously). The system also enhances interoperability with US Navy, NATO and other allied receivers. This requirement was established by AMC Mission Need Statement (MNS) 003-92 and AMC Operational Requirements Document (ORD) 003-92-I/II.

(U) FY 1992 Accomplishments:

- (U) Not Funded

(U) FY 1993 Planned Program:

- (U) Not Funded

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Program Element: #0401218F
PE Title: KC-135 Squadrons

Budget Activity: #3 Strategic Programs

(U) FY 1994 Planned Program:

- (U) Release Request for Proposal
- (U) Conduct Source Selection
- (U) Award Competitive Engineering Manufacturing Development (EMD) contract

(U) Program to Completion:

- (U) Modify and Flight test two aircraft each with a different manufacturer's pod
- (U) Award Group A production contract and a competitive Group B contract in fourth quarter FY 1997
- (U) Conduct kit proofing on first five kits FY 1999
- (U) Group A kit installs on PDM line in conjunction with receptacle kit installation beginning in FY 1999 and ending in FY2004

(U) Work Performed By: The MPRS modification effort will be managed by the Program Development Manager (PDM) for the System Program Manager (SPM). The PDM is located at ASC/SDC, Wright Patterson AFB OH. The SPD is located at OC-ALC/LAC, Tinker AFB OK. The PDM will conduct a competitive source selection for the development portion of the program. During the production phase, the PDM will award a sole-source contract for the Group A (aircraft modification) to the winner of the EMD contract. The PDM will conduct a competition for the Group B (pods, pylons) from the two pod manufacturers competing during the development phase. Installation of Group A kits will be accomplished at depot during PDM. Location of depot will be the decision of the SPM

(U) Related Activities: None

(U) Other Appropriation Funds (\$ in Million):

(U) Aircraft (3010) Procurement:

<u>FY 1992</u> <u>Actual</u>	<u>FY1993</u> <u>Estimate</u>	<u>FY1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
0.0	0.0	0.0	368.1	368.1

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: US/Australia Data Exchange Annex (DEA) AF-90-AUST-7019 to Air to Air Refueling

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0401840F

Project: N/A

PE Title: Air Mobility Command
Command & Control (AMC C2)

Budget Activity: #4-Tactical Programs

Project Title: Information Processing System (IPS)

NOT APPLICABLE

POPULAR NAME: AMC C2 IPS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

<u>SCHEDULE</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To Complete</u>
Program	*MAISRC	MAISRC	MAISRC	
Milestones	MS IIIA July	IPR May	MS IIIB May	FOC 20tr FY96
Engineering Milestones		Increment 2 Critical Des Review Feb	Increment 3 Critical Des Review Aug	Increment 4 Critical Des Rev 30tr FY95
T&E Milestones	Increment 1 OT&E Mar	Increment 2 DT&E Jul	Increment 2 OT&E Mar	Increments 3&4 OT&E 1Qtr FY 95&96. resp
Contract Milestones	Increment 2 Software Spec Review Oct		Increment 3 Software Spec Review Jun	Increment 4 Software Spec Rev 20tr FY95
<u>BUDGET</u>				<u>Program Total</u>
(\$000)	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>(To Complete)</u>
Major Contracts	7,435	7,372	7,266	48,500 (6,494)
Support Contract	2,980	2,928	3,023	33,800 (2,850)
In-House Support	560	987	1,072	6,105 (1,015)
GFE/ Other	0	795	0	795
Total	10,975	12,082	11,361	89,200 (10,359)

* MAISRC - Major Automated Information Systems Review Council

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Program Element: #0401840F
PE Title: Air Mobility Command
Command & Control (AMC C2)

Project: N/A
Budget Activity: #4-Tactical Programs

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Information Processing System (IPS) develops communications and information processing hardware and software for all echelons of the Air Mobility Command (AMC) Command and Control (C2) system. It satisfies essential elements of the AMC C2 architecture validated in AMC Statement of Need (SON) 3-81. The integration of IPS computer resources and software with improved High Frequency (HF) equipment, new Ultra High Frequency (UHF) satellite networks, and other available communications media will result in a unified AMC C2 system. The IPS will be developed and installed in four increments. Increment 1 will provide a digital data message handling capability at each IPS node and implement mission execution monitoring. Increment 2 will build on Increment 1 software to support mission planning and scheduling. Increments 3 & 4 will augment the planning and scheduling capabilities of Increment 2 as well as install Satellite Communications (SATCOM) communications interfaces and multi-level security features. As a result of the Chief of Staff, United States Air Force (CSAF) Command, Control, Communications, and Intelligence (C4I) Broad Area Review (BAR), an initiative was set forth to improve theater C4I by coordinating and integrating on-going and planned development activities in an effort to eliminate redundancy in TBM architecture and reduce proliferation of computer systems. Air Force directed the development and implementation of an incremental migration strategy to merge the best features of IPS and two other MAJCOM initiatives into the design for a single wing-level C2 system.
- C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
1. (U) FY 1992 Accomplishments:
 - (U) Completed development of Increment 1 software.
 - (U) Conducted Major Automated Information Systems Review Council (MAISRC) Milestone IIIA.
 - (U) Initiated Increment 2 software development.
 2. (U) FY 1993 Planned Program:
 - (U) Complete Increment 2 software development.
 - (U) Initiate Increment 3 software development.
 - (U) Upgrade software to Increment 2 at previously installed nodes.
 3. (U) FY 1994 Planned Program
 - (U) Complete Increment 3 software development.
 - (U) Initiate Increment 4 software development.
 - (U) Upgrade software to Increment 3 at previously installed nodes.
 - (U) Begin efforts to incrementally migrate selected IPS features into a single Air Force Wing Command and Control System (AFWCCS) capability.
 4. (U) Program to Completion:
 - (U) Complete development of single standard (AFWCCS) capability.
- D. (U) WORK PERFORMED BY: The IPS program is managed by Electronic Systems Center, Hanscom AFB MA. The IPS contractor is Computer Sciences Corporation (CSC), Moorestown, New Jersey.

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Program Element: #0401840F
 PE Title: Air Mobility Command
Command & Control (AMC C2)

Project: N/A
 Budget Activity: #4-Tactical Programs

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Increment 2 software testing delayed 11 months due to contractor problems with concurrent Increment 1 & 2 software development. Follow-on software increments similarly impacted.
3. (U) COST CHANGES: Minor budget adjustments. FY93 net increase of \$800K due to general reduction of \$500K and increase of \$1.4M due to reprogramming from PE 0303601F for standard AFWCCS support.

F. (U) PROGRAM DOCUMENTATION:

- (U) MAC SON 3-81 Mar 81
- (U) PMD 4040(9)/41840F Mar 92
- (U) MAC SORD 03-81-II Jun 91

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0207438F, Theater Battle Management C4I (TBM C4I), is developing a wing level standard command and control system for the Air Force that will incorporate the best features developed for IPS.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Other Procurement: (BPAC, 834070)

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost	7,178	19,195	25,950	42,800	107,400
Quantity*	8	20	43	98	169

* Unit cost depends on procured IPS configuration.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
IOT&E Inc 1	Apr 92	IOT&E successfully completed at McGuire AFB.

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
OT&E Inc 2	1Q FY 94	Inc 2 OT&E delayed 11 months due
OT&E Inc 3	1Q FY 95	to contractor problems with Inc 1
OT&E Inc 4	1Q FY 96	software development.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101F

Budget Activity: #1 - Technology Base

PE Title: In-House Laboratory
Independent Research

A. (U) RESOURCES (\$ In Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
In-House Laboratory Independent Research					
	6,029	4,730	5,155	Cont	TBD
Total	6,029	4,730	5,155	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides funds for Air Force Laboratory Commanders/Directors to use in pursuing promising, high risk, high payoff research opportunities which arise during the fiscal year. This program permits Air Force laboratories to maintain an aggressive research program vital to their role as leaders in national research. The Air Force manages this program with the intent that there be a high degree of flexibility prior to beginning work, relying on the technical judgement of each of the Laboratory Commanders/Directors. The laboratories annually report their achievements of the past year and the status of their projects to an Air Force evaluation panel chaired by the Air Force Materiel Command Chief Scientist. Distribution of funds is based on the technical quality of the research presented each year.

C. (U) JUSTIFICATION FOR A SINGLE PROJECT LESS THAN \$10.0 MILLION IN FY 1994:

(U) FY 1992 Accomplishments:

- (U) Discovered a bacterium that can biodegrade ammonium perchlorate rocket propellant present in wastewater streams resulting from solid rocket motor propellant removal operations.
- (U) Demonstrated the world's first non-scanning, solid state, three-dimensional laser radar imaging system which may create a new class of laser radars for the Air Force.
- (U) Tested the usefulness of atmospheric aerosol forward scattering of long wavelength infrared radiation for application to covert, point-to-point, over-the-horizon communications.
- (U) Demonstrated liquid crystal filters for instruments to make more accurate predictions of solar flares that cause disruptions to military communications.
- (U) Developed instrumentation for use in new heat transfer imaging techniques designed to validate novel cooling schemes for aircraft engine components in high temperature environments.

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Program Element: #0601101F
PE Title: In-House Laboratory
Independent Research

Budget Activity: #1 - Technology Base

- (U) Produced a set of synthetic aperture radar image fidelity and quality metrics to be used for interpretability analysis.
 - (U) Utilized state-of-the-art quantum chemical techniques to determine the nonlinear optical properties of polymer molecules for use in electro-optical devices.
 - (U) Developed a neural network analysis technique for measuring human operator workload using facial muscle response patterns.
- (U) FY 1993 Planned Program:
- (U) The purpose of this Program Element is to support flexible and aggressive in-house research. The results of the FY 1992 program were reviewed by the Air Force Technical Evaluation Panel.
 - (U) Distribution of the FY 1993 funds was made based on panel findings of technical merit within the programs.
 - (U) Selected research programs will continue into FY 1994.
 - (U) New research programs will be selected by peer review within each laboratory.
- (U) FY 1994 Planned Program:
- (U) The same management approach will be used as that used in FY 1993.
- (U) Worked Performed By: This is totally a laboratory directed research program in which all Air Force laboratories participate, performing the work in-house, and awarding contracts only on an exceptional basis.
- (U) Related Activities:
- (U) PE 0601101A, In-House Laboratory Independent Research.
 - (U) PE 0601152N, In-House Laboratory Independent Research.
 - (U) Program results transition to a variety of laboratory development activities for continued funding.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102F
PE Title: Defense Research Sciences

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2301 Physics	19,234	18,697	20,031	Cont	TBD
2302 Solid Mechanics and Structures	10,913	11,807	12,723	Cont	TBD
2303 Chemistry	24,354	25,665	29,574	Cont	TBD
2304 Mathematical and Computer Sciences	23,768	26,922	31,039	Cont	TBD
2305 Electronics	27,388	27,443	28,127	Cont	TBD
2306 Structural Materials	10,228	10,481	12,028	Cont	TBD
2307 Fluid Mechanics	12,756	13,984	14,707	Cont	TBD
2308 Propulsion	9,691	11,064	12,515	Cont	TBD
2309 Terrestrial Sciences	10,343	10,830	4,409	Cont	TBD
2310 Atmospheric Sciences	8,069	8,303	9,052	Cont	TBD
2311 Space Sciences	6,342	5,883	6,617	Cont	TBI
2312 Biological Sciences	10,286	11,677	19,222	Cont	TBD
2313 Human Performance	9,494	10,125	11,805	Cont	TBD
4113 Science and Engineering Education Programs	9,381	13,889	15,968	Cont	TBD
4161 Defense Business Operations Fund	9,100	12,500	13,500	Cont	TBD
4284 Advanced Optical System	0	16,481	0	0	16,481
Total	201,347	235,751	241,317	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program, managed by the Air Force Office of Scientific Research (AFOSR), supports Air Force research efforts comprised of in-house investigations in Air Force laboratories and extramural activities in academia and industry. The program element funds broad-based scientific and engineering basic research in technologies critical to the Air Force mission and in the search for future critical technologies. These technologies include aerospace structures, aerodynamics, materials, propulsion, power, electronics, computer science, directed energy, conventional weapons, life sciences, and terrestrial, atmospheric, and space sciences.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 2301, Physics: This project provides scientific information to the technology base to help solve Air Force problems in new weapon systems development, electromagnetic countermeasures, nuclear weapons effects, communications,

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Program Element: #0601102F
PE Title: Defense Research Sciences

Budget Activity: #1 - Technology Base

nondestructive and nonintrusive testing and analysis, and new materials development. Therefore, research is supported in Photonic Physics, Optics, Plasma Physics, Atomic and Molecular Physics, and X-ray Physics.

(U) FY 1992 Accomplishments:

- (U) Proved low density collisional plasmas are effective as broad-band radio-frequency absorbers/modulators for low-observable applications.
- (U) Transferred novel high power microwave source to industry.
- (U) Established cost-effective code to predict energy levels of highly energetic compounds and explosives.
- (U) Modeled and built first high reflection x-ray mirror for use in x-ray laser systems.

(U) FY 1993 Planned Program:

- (U) Research wafer-scale union in optically interconnected, millimeter-wave integrated circuits (IC) for signal/phase distribution and control functions.
- (U) Study electro-optic generation of high power electromagnetic pulses for impulse radars.
- (U) Conduct x-ray imaging and x-ray holography research with applications to next generation IC fabrication.
- (U) Study nonlinear optical techniques in gases and vapors trapped in solid state, cage-like materials.
- (U) Research independent control of surface emitting laser arrays for optical computing.

(U) FY 1994 Planned Program:

- (U) Research adaptive telescopes, space object imaging, identification, and high power semiconductor laser arrays.
- (U) Begin conversion of existing, high quality lasers to particular wavelengths needed for special applications, focusing on semiconductor-pumped solid state lasers and three-frequency mixing in nonlinear optical materials.
- (U) Concentrate x-ray optical studies on developing devices using advanced beam-plasma interaction concepts and expand new numerical modeling tools.

- (U) Work Performed By: Wright Laboratory, Wright-Patterson AFB, OH, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: Stanford University, Stanford, CA; University of New Mexico, Albuquerque, NM; University of Arizona, Tucson, AZ; University of Maryland, College Park, MD; and University of Southern California, Los Angeles, CA.

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602601F, Advanced Weapons.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

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Program Element: #0601102F
PE Title: Defense Research Sciences

Budget Activity: #1 - Technology Base

2. (U) Project 2302, Solid Mechanics and Structures: This work produces the necessary scientific and technical knowledge for the design and operation of superior aerospace weapon systems and support installations. Research is conducted in structural dynamics, mechanics of materials, particulate mechanics, and structural mechanics. Future aerospace structures, airframe, space platform, and engines will be constructed mainly from composite materials. The anisotropy, inhomogeneity, and damage characteristics of these materials dictate the development of new solid mechanics and structural principles which are critical for performance prediction and material synthesis. Research in structures includes nonlinear dynamics aeroelastic smart structures, fluid/structural mechanics, and damage mechanisms. Extreme service environment (space, blast, thermal, and electric-magnetic field) that these structural systems must experience has made the development of fundamentals of solid mechanics theory a necessity.

(U) FY 1992 Accomplishments:

- (U) Completed model for polycrystalline solids that provides the fundamentals for deformation and failure prediction of metallic structures in elevated temperature environments.
- (U) Successfully identified and modeled brittle ceramic-matrix composite damage and failure.
- (U) Formulated a mathematical microstructural formulation that describes the behavior of materials used in airfields.
- (U) Captured and quantified chaotic behavior in space structures.

(U) FY 1993 Planned Program:

- (U) Study the soil transport and resulting fate of chemicals in the environment.
- (U) Conduct fundamentals of solid mechanics research to address composite structures.
- (U) Research self-adaptive smart structures that integrate sensors and actuators into the distributed structural system of aerospace vehicles.

(U) FY 1994 Planned Program:

- (U) Research high-temperature behavior of structural ceramics, metallics, and ceramic composites to accurately predict their performance under cyclic thermomechanical loading at high average temperatures.
- (U) Investigate the fundamental relationship between microstructural material imperfections and flaws at the structure level.
- (U) Research carbon/carbon composites to develop the mechanics methodology for predicting the effects of various proposed oxidation protection systems.
- (U) Conduct biomimetic research on the structure and function of naturally-evolved materials.

- (U) Work Performed By: Wright Laboratory, Wright-Patterson AFB, OH, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: Northwestern University, Evanston, IL; University of California, Berkeley, CA; Purdue University, West Lafayette, IL; Virginia Polytechnic University, Blacksburg, VA; and University of Illinois, Urbana, IL.

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Program Element: #0601102F
PE Title: Defense Research Sciences

Budget Activity: #1 - Technology Base

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602206F, Civil Engineering and Environmental Quality.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2303, Chemistry: Research in chemistry seeks the knowledge and understanding required to develop new materials as well as improved means to synthesize existing materials. Advances are sought in Air Force technological capabilities in structural and electronic materials, electromagnetic and conventional weaponry, electrochemical power systems, and new propellants. Specific research emphasizes synthesis and characterization of higher performance and lower cost nonmetallic materials for application as structural composites, lubricants, and sealants. Unique chemical approaches characterize polymeric and elastomeric materials, ceramics, glass, semiconductors, and composite structures. A detailed description is sought of atomic-level surface interactions that can limit performance of electronic devices and lubricant materials. Separate, but similar, investigations of molecular energy release mechanisms and energy storage in metastable molecular systems foster advances in laser weapons development, new chemical propellants, and electrochemical power systems.

(U) FY 1992 Accomplishments:

- (U) Developed new methods to control nanoscale morphology of polymer alloys by exploiting the phase transition behavior of the materials under externally applied strain.
- (U) Developed an understanding of the chemical kinetics and spectroscopy of iodine chemical lasers for use in a system of "laser machining" precision jet engine parts.
- (U) Utilized powerful new imaging tools to reveal the motion of atoms and molecules on irregular surfaces and provide insight for new classes of lubricants.
- (U) Produced molded-hole composites based upon "biomimicking" insect exoskeletal architecture for 20%-45% gains in material tensile strength versus drilled holes.

(U) FY 1993 Planned Program:

- (U) Research "multifunctional" polymer materials that combine, within a single macromolecule, a diverse set of segments, each carefully designed for a different characteristic such as strength or piezoelectricity.
- (U) Focus biomimetics on growth of inorganic crystals, highly controlled with respect to size, shape, morphology, and position by a synthetic analog of the biomembrane found in mollusk shells or in magnetite-forming bacteria.
- (U) Develop advanced coating concepts for high-temperature, carbon/carbon composite structures based on atomic level surface chemistry.

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Program Element: #0601102F
PE Title: Defense Research Sciences

Budget Activity: #1 - Technology Base

- (U) Combine organic and inorganic polymers for a new class of materials called "ceramers", utilizing alloying and combined polymer structures (copolymers).
- (U) FY 1994 Planned Program:
 - (U) Initiate research to apply the mathematical theory of optimization to the "up front" design of polymers for optimum properties.
 - (U) Study catalysts to convert waste heat from aircraft to higher energy "endothermic" fuels, and in decomposition of these advanced fuels to prevent clogging of fuel inlets.
 - (U) Research the processes needed to preserve the high energy content of rocket fuels pending combustion, such as isolation in stabilized matrices/clusters.
- (U) Work Performed By: Wright Laboratory, Wright-Patterson AFB, OH, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: California Institute of Technology, Pasadena, CA; Cornell University, Ithaca, NY; Massachusetts Institute of Technology, Cambridge, MA; SRI International, Menlo Park, CA; and University of California, Los Angeles, CA.
- (U) Related Activities:
 - (U) PE 0602102F, Materials.
 - (U) PE 0602302F, Rocket Propulsion and Astronautics.
 - (U) PE 0602601F, Advanced Weapons.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 4. (U) Project 2304, Mathematical and Computer Sciences: This research focuses on the discovery of methods to provide for mathematical modeling, simulation, and control of complex systems and to provide analytical and computational methods to solve problems of critical importance to the Air Force. Topics include: effective utilization of high-performance computers; control of aerospace systems; models and computational tools for the design of aircraft, missiles, or other weapons; efficient production of large-scale, well-documented computer programs and software; communication and information theory; signal processing; artificial intelligence in surveillance systems or independent weapons; reliability and maintainability; and the allocation of resources in logistics or operational activities using ideas from optimization and linear programming theories.
- (U) FY 1992 Accomplishments:
 - (U) Obtained a solution for the matrix Riccati equation, a critical component in control design and implementation which permits the fast, accurate solution of Riccati equations involving hundreds/thousands of state variables.
 - (U) Designed a new higher order language for specifying distributed Ada programs that allows formal specifications for system properties such as synchronization, data

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communications, and timing which can guide the development of software and automate the error detection process during testing and validation.

- (U) Developed a combination of the emerging theory of wavelets and well-established systems and control techniques of optimal estimation and Kalman filtering for efficient sensor fusion and anomaly detection algorithms.
- (U) Applied novel numerical image enhancement techniques for sharp capture of shock in flows to de-blur edges in reconnaissance images.

(U) FY 1993 Planned Program:

- (U) Study algorithms and software to promote effective utilization of parallel computing.
- (U) Initiate a program in computing with oscillators.
- (U) Conduct research in intelligent teaching.
- (U) Research electronic prototyping including computational geometry issues that relate to automated manufacturing and to electronic design.

(U) FY 1994 Planned Program:

- (U) Investigate modeling electromagnetic wave propagation through plasmas.
- (U) Combine advanced analytic techniques for nonlinear optimization with intelligent search/neural networks to compute stable molecular structures.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, Wright Laboratory, Wright-Patterson AFB, OH, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: Massachusetts Institute of Technology, Cambridge, MA; University of Illinois, Urbana, IL; University of Maryland, College Park, MD; University of North Carolina, Chapel Hill, NC; and University of Wisconsin, Madison, WI.

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603728F, Advanced Computer Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2305, Electronics: Research is conducted to provide the fundamental basis for developing future generations of electronic devices and systems that enable new Air Force capabilities such as battle information management systems, countermeasures, sensors, and the more electric aircraft concept. The goals are to increase the data and information processing speed of electronic systems, to firmly control their complexity and reliability, and to improve the security and reliability of information and data transmission. Research in this program is concerned with the understanding of fundamental principles that govern electronic processes which will

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enable the engineer to model and predict performance of electronic devices and systems. Research will be pursued on semiconductor devices for high-speed digital and analog signal processing, microwave and millimeter wave signal and power generation, microwave tubes, superconducting analog signal processing, optical signal processing for target recognition and terminal guidance, and nuclear radiation hardening of circuits and devices.

(U) FY 1992 Accomplishments:

- (U) Developed ultra-sensitive superconductor technique to detect micro-cracks.
- (U) Established foundation for first blue-green emitting laser for application in cockpit displays.
- (U) Found novel material giving the fastest known switching time for optical data transmission.
- (U) Established advanced processing technique for the highest continuous wave power output in vertical cavity surface emitting laser diodes.

(U) FY 1993 Planned Program:

- (U) Initiate program on silicon-germanium alloys for advanced electronic devices.
- (U) Examine ultra-high frequency applications of high-temperature superconductive electronics along with more complex/faster signal processing via millimeter and optical systems.
- (U) Study electronic and photonic device structures for optical frequency modulation, selected area heteroepitaxy for wafer level integration, and atomic level transitions for high density information storage.

(U) FY 1994 Planned Program:

- (U) Begin fundamental research on optical and millimeter wave realizations of highly efficient circuitry.
- (U) Study device physics and problems arising from fabrication of ultra-small devices.
- (U) Investigate high-temperature superconductive electronics and compare with existing standards.
- (U) Begin materials and device research for ultra-far infrared detectors for surveillance applications.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, Wright Laboratory, Wright-Patterson AFB, OH, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: University of California, Santa Barbara, CA; University of California, Berkeley, CA; University of Southern California, Los Angeles, CA; University of Texas, Austin, TX; and Cornell University, Ithaca, NY.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603728F, Advanced Computer Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

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(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 2306, Structural Materials: Materials research provides the knowledge for improving the performance, cost, and reliability of structural materials. Structural materials research studies a broad range of material properties such as strength, toughness, fatigue resistance, and corrosion resistance of airframe, turbine engine, and spacecraft materials. Emphasis is on refractory alloys, intermetallics, metal and ceramic matrix composites, advanced alumina systems, silicon carbide, silicon nitride, and carbon/carbon. Research in new processing methods complements research on materials properties. Direct goals of this program are to increase the operating temperature and thrust-to-weight ratio of engines, develop improved aerospace vehicle structural materials, and control or eliminate advance material reliability issues related to high-temperature strength, toughness, fatigue, and environmental conditions.

(U) FY 1992 Accomplishments:

- (U) Achieved dramatic improvements in room temperature ductility and high-temperature strength for nickel aluminide single crystal materials which offer significant payoffs in gas turbine engine applications.
- (U) Developed high-toughness, laminated, ceramic composites based on alumina that take advantage of crack deflection mechanisms at layer interfaces.
- (U) Conducted surface and interface studies in carbon-carbon materials to improve their environmental resistance.
- (U) Developed an understanding of microstructure effects on macroscopic properties of structural materials emphasizing alloy theory and development of metal and ceramic matrix composites, niobium alloys, and intermetallics.

(U) FY 1993 Planned Program:

- (U) Develop a fundamental understanding of oxidation, processing, and mechanical behavior of carbon/carbon composites and the high-temperature behavior of ceramic matrix composites.
- (U) Research the relationships between the compositional and microstructural features of metals and ceramics and their physical/chemical/mechanical properties.
- (U) Study high-temperature structural materials for propulsion applications and lightweight materials for aircraft and spacecraft with mechanical properties, processability, reliability, and maintainability being emphasized.
- (U) Initiate study of nanocrystalline metallic structural materials focusing on processing, property mechanisms, characterization, and material stability.

(U) FY 1994 Planned Program:

- (U) Research the high-temperature mechanical behavior of ceramic matrix composites and the role of the interface between the matrix and the reinforcement in controlling the properties.
- (U) Research very high-temperature structural materials for skins of aerospace vehicles and for advanced propulsion systems.

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- (U) Study high-temperature fracture mechanics, the fundamental understanding of surface reactivity of carbon/carbon, and innovative processing of complex high-temperature materials such as ceramic and metal matrix materials.
- (U) Work Performed By: Wright Laboratory, Wright-Patterson AFB, OH, Rome Laboratory, Griffiss AFB, NY, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: Massachusetts Institute of Technology, Cambridge, MA; University of Illinois, Urbana, IL; Rockwell International, Thousand Oaks, CA; Stanford University, Stanford, CA; and Westinghouse Electric Corporation, Pittsburgh, PA.
- (U) Related Activities:
 - (U) PE 0602102F, Materials.
 - (U) PE 0603211F, Aerospace Structures.
 - (U) PE 0708011F, Manufacturing Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 7. (U) Project 2307, Fluid Mechanics: This research provides the knowledge and methodologies for improving the efficiency and effectiveness of aerospace vehicles. Research seeks to provide an understanding of key fluid flow phenomena, to improve theoretical models for aerodynamic prediction and design, and to originate flow control concepts and predictive methods to expand current flight performance boundaries. Research issues include the development of computational methods to predict complex flows, prediction of real gas effects in high speed flight, turbulence prediction and control in shear flows affecting vehicle aerodynamics, the dynamics of unsteady and separated flows associated with enhanced flight vehicle maneuverability, and heat transfer and flow instabilities in gas turbine engines.
 - (U) FY 1992 Accomplishments:
 - (U) Established new turbulence model using renormalization group methods.
 - (U) Demonstrated theoretical control of a random, turbulent solution to the Burger's equation using neural network and suboptimal control approaches.
 - (U) Provided new methodology to a high-speed compressor development program for active control of jet engine stall.
 - (U) Discovered new flow topology that will enable control of unsteady vortex formation over a highly swept wing.
 - (U) Implemented a novel unsteady forebody bleed technique to control vortices and achieve high angle-of-attack yaw authority.
 - (U) FY 1993 Planned Program:
 - (U) Conduct computational fluid dynamics research exploiting increased parallelism in emerging computer architectures.

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- (U) Study unsteady aerodynamics emphasizing control of longitudinal vortex structures and computational methods for prediction of supermaneuverable aircraft airflows.
- (U) Research flow control to provide the basis for reducing aerodynamic drag and for enhancing mixing in combustors.
- (U) Explore methods for control of rotating stall and surge in engine compressors.

(U) FY 1994 Planned Program:

- (U) Develop turbulence models which include the effects of compressibility for application to complex high-speed aerodynamics.
- (U) Study convective heat transfer for improved predictive techniques in highly turbulent flows.
- (U) Explore the development of auto-adaptive and three-dimensional unstructured grid techniques for flows around complex shapes.
- (U) Research active control methods for stable operation of gas turbine engines and enhanced cooling of turbine blades.
- (U) Examine vortex control strategies for enhanced post-stall maneuverability.

- (U) Work Performed By: Wright Laboratory, Wright-Patterson AFB, OH, and Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: Massachusetts Institute of Technology, Cambridge, MA; Princeton University, Princeton, NJ; Stanford University, Stanford, CA; University of Southern California, Los Angeles, CA; and University of Washington, Seattle, WA.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

8. (U) Project 2308, Propulsion: This project investigates the efficient utilization of energy in Air Force propulsion and weapon systems including airbreathing engines and chemical and non-chemical rockets. Research is organized into the areas of chemically reacting flow, non-chemical energetics, and diagnostics. Chemically reacting flows involve complex coupling between energy release through chemical reaction and the flow processes which transport chemical reactants, products, and energy. Non-chemical energetic systems include plasma and beamed energy propulsion for orbit raising space missions and efficient ultra-high energy thermionic systems for space-based energy utilization. Thermal management of space-based power and propulsion systems will be addressed. Research in diagnostics supports the first two areas by providing critically needed measurement capabilities for processes such as spray and solid propellant combustion, and plasma propulsion.

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(U) FY 1992 Accomplishments:

- (U) Modeled droplet combustion response and spray structure in rocket chambers at supercritical thermodynamic conditions to help prevent combustion instability.
- (U) Completed model of plasma instabilities and their effects on transport coefficients for realistic predictions of thruster efficiency.
- (U) Completed a numerical experiment predicting the behavior of a supersonic combustor shear layer that suppresses mixing in scramjet combustors.
- (U) Determined the dominance of charged chemical species that help predict the evolution of gas-phase precursors to soot formation in combustors.

(U) FY 1993 Planned Program:

- (U) Explore the suppression of mixing and chemical reaction in supersonic shear layers as compared with behavior in subsonic mixing layers.
- (U) Continue research into fuel spray behavior, soot inhibition, and planar laser-induced fluorescence imaging.
- (U) Investigate nonequilibrium dynamics and instabilities relevant to plasma thruster performance and the analysis of flowfield and dissipation in arcjets.

(U) FY 1994 Planned Program:

- (U) Continue study of degenerate four-wave mixing and laser-induced fluorescence for plasma measurements.
- (U) Research droplet and spray behavior to include the coupling between sprays and the appearance of instabilities in liquid-fueled rockets, and the dispersion of nondilute sprays in gaseous turbulent shear layers.
- (U) Investigate fuel droplet behavior at resolutions smaller than the droplet size to explore the phenomenon of turbulence modulation by droplets.
- (U) Extend quantitative multidimensional imaging techniques to time-resolved measurements in three dimensions and the characterization of plasmas.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM, and Wright Laboratory, Wright-Patterson AFB, OH, conduct research under this project. The top contractors or universities are: California Institute of Technology, Pasadena, CA; Massachusetts Institute of Technology, Cambridge, MA; Pennsylvania State University, University Park, PA; Princeton University, Princeton, NJ; and Yale University, New Haven, CT.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602302F, Rocket Propulsion and Astronautics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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9. (U) Project 2309, Terrestrial Sciences: This project provides fundamental research in geodesy, gravity, and seismology. Precise understanding of the size and shape of the changing earth's surface is required to assure the accuracy of existing and planned navigational systems. Basic research in geodesy and gravity seeks to improve inertial navigation systems (INS) for guidance of aircraft, weapons, and spacecraft. Research in this subarea includes gravity field modeling, inertial instrumentation, and Global Positioning System (GPS) geodesy to determine the maximum utility of using GPS for precise satellite navigation and attitude control. Basic research in seismology is required to understand the propagation through the earth of seismic waves caused by underground explosions. This research will provide an improved teleseismic monitoring capability required to effectively monitor compliance with nuclear test ban treaty agreements, and will also help detect nuclear proliferation by improving the detection and identification of small nuclear tests.

(U) FY 1992 Accomplishments:

- (U) Completed a feasibility study comprising simulations and covariance analyses to demonstrate the use of GPS satellites and a balloon-borne INS system for improved horizontal gravity measurements.
- (U) Completed rockburst investigations for discriminating between rockburst seismic signatures and those for earthquakes or chemical/nuclear explosions.
- (U) Completed Eurasian deep seismic sounding investigation to establish seismic wave travel times from source to sensor.

(U) FY 1993 Planned Program:

- (U) Continue support to the Joint Seismic Program and the Global Seismic Network (GSN).
- (U) Initiate research efforts needed to resolve problems involved in discriminating between nuclear underground tests and other types of underground or surface explosions.
- (U) Continue geodesy and gravity research to improve the accuracy of gravity estimation for inertial guidance and navigation systems and to develop new inertial systems for improved space and air navigation.
- (U) Initiate research to more accurately determine location and depth of natural and man-made underground events.

(U) FY 1994 Planned Program:

- (U) Conduct detection and discrimination research on multi-channel filtering, automatic detection discrimination, automated detection and signal characterization.
- (U) Interpret data from the GSN and from all archival and active data station sources.

- (U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM, conducts research under this project. The top contractors or universities are: California Institute of Technology, Pasadena, CA; Harvard University, Cambridge, MA; Columbia University, New York, NY; Southern Methodist University, Dallas, TX; University of Texas at El Paso, El Paso, TX; Massachusetts Institute of Technology, Cambridge, MA; and the Incorporated Research Institutions for Seismology (IRIS), Washington, DC.

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(U) Related Activities:

- (U) PE 0602101F, Geophysics.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602206F, Civil Engineering and Environmental Quality.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 2310, Atmospheric Sciences: This research includes the physics, dynamics, and chemistry of processes that determine the structure and variability of the earth's atmosphere. Atmospheric properties such as wind, density, clouds and precipitation, ionization, and optical/infrared (IR) transmission/emissivity all affect the performance of Air Force systems. A major effort is devoted to development and use of new measurement techniques and the development of models for specifying and predicting weather and other atmospheric conditions. Emphasis is also placed on understanding atmospheric effects on optical and IR weapon systems, and on understanding the dynamics and structure of the ionosphere that affect communications and surveillance systems. Major research efforts focus on the optical/IR environment, ionospheric dynamics, and meteorology.

(U) FY 1992 Accomplishments:

- (U) Identified a potential source for false satellite echoes as seen from surveillance radars.
- (U) Studied the physics and dynamics of the lower atmosphere and meteorology to improve weather prediction for conventional and high technology weapon systems.
- (U) Developed a circular polarization technique that enables forecasters to see the electric charge as it builds in a thundercloud in real-time.
- (U) Published a new edition of HITRAN, a spectral line-by-line atmospheric transmission code that includes expanded spectral coverage and two additional molecular species.

(U) FY 1993 Planned Program:

- (U) Conduct mesoscale meteorology research for improving numerical models of battlefield-scale forecasts.
- (U) Research the atmosphere's transmission and emission characteristics that effect electro-optic reconnaissance and precision-guided munitions.

(U) FY 1994 Planned Program:

- (U) Determine more accurate aerosol models, develop a better understanding of molecular/particle-radiation interactions, and improve spectrometric techniques.
- (U) Conduct research on coupling the atmosphere's fluid behavior with its chemistry, particularly in the middle/upper atmosphere.

- (U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM, conducts research under this project. The top contractors or universities are: Massachusetts Institute of Technology,

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Cambridge, MA; Colorado State University, Fort Collins, CO; Utah State University, Logan, UT; Pennsylvania State University, University Park, PA; and SRI International, Menlo Park, CA.

(U) Related Activities:

- (U) PE 0602101F, Geophysics.
- (U) PE 0305160F, Defense Meteorological Satellite Program.
- (U) PE 0603220C, Surveillance, Acquisition, Tracking, and Kill.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

11. (U) Project 2311, Space Sciences: The objective of this project (title previously changed from "Astronomy and Astrophysics" but with no content change) is to provide basic knowledge of the space environment (mostly solar events) for the design and calibration of advanced Air Force systems. The project also supports the Air Weather Service (AWS) by improving observing and forecasting techniques that support operational military systems. Theoretical and empirical descriptions of the electrodynamics of the solar atmosphere and magnetosphere, which are critical elements of future AWS prediction models and radiation belt codes, are being investigated.

(U) FY 1992 Accomplishments:

- (U) Provided an improved space weather prediction model to AWS.
- (U) Coordinated experiments between the Combined Release Radiation Effects Satellite (CRRES) and the Arecibo Ionospheric Heating Facility for radiation belt model development that aids in selecting satellite orbits.
- (U) Determined the relationship between solar activity and geomagnetic disturbances required for a predictive capability of the occurrence and severity of geomagnetic storms and their associated radiation effects.

(U) FY 1993 Planned Program:

- (U) Validate a three-dimensional (3-D) magnetohydrodynamic (MHD) model which predicts solar activity.
- (U) Initiate a study on the interplanetary propagation and spectral characteristics of those particle events which can seriously degrade or disrupt Air Force systems.
- (U) Begin studies on the radiation dosage for background galactic and solar cosmic rays for selected spacecraft altitudes and inclinations.

(U) FY 1994 Planned Program:

- (U) Couple magnetospheric current systems with newly developed boundary layer models and ionospheric models for advanced space weather specification and prediction models.

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- (U) Extend beam-plasma equilibrium simulation code to include electrodynamic processes necessary for the generation of very low frequency (VLF) waves.
 - (U) Investigate the heating of ionospheric electrons exposed to the intense very high frequency electromagnetic waves emitted by the shuttle payload.
 - (U) Design a space-based solar mass ejection imager to test the effectiveness of fast solar wind stream measurements for the forecasting of solar disturbances.
- (U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM, conduct research under this project. The top contractors or universities are: Boston College, Chestnut Hill, MA; University of Wyoming, Laramie, WY; Columbia University, New York, NY; California Institute of Technology, Pasadena, CA; University of Arizona, Tucson, AZ; and Yale University, New Haven, CT.
- (U) Related Activities:
- (U) PE 0602101F, Geophysics.
 - (U) PE 0602702F, Command, Control, and Communications.
 - (U) PE 0603410F, Space Systems Environment.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
12. (U) Project 2312, Biological Sciences: This project consists of three research areas: environmental and general toxicology and effects of biohazards; neuroscience; and chronobiology. Environmental toxicology or environmental quality research has been expanded in order to provide the basic understanding of the fate and effects of Air Force chemicals and materials on the environment. This understanding is required in order to develop efficient and cost-effective strategies to clean up contaminated sections of air bases and to mitigate future environmental contamination due to Air Force operations. Knowledge of the mechanisms by which Air Force chemical and physical agents can cause toxic responses in organisms will allow the development of procedures to prevent toxicity and provide strategies for the development of new materials that will not be harmful to man or the environment. Basic research in neuroscience and chronobiology will result in new strategies to prevent G-induced loss of consciousness in pilots, impaired performance due to jet-lag and shift-work, and loss of life and aircraft due to stress, inattention, or lack of vigilance. Neuroscience research to develop computer architectures modeled after neuronal systems is aimed at providing powerful new approaches to machine intelligence.
- (U) FY 1992 Accomplishments:
- (U) Discovered two distinct mechanisms by which a selected strain of bacteria can remove a series of toxic heavy metals from contaminated solutions.
 - (U) Determined the neurochemicals which regulate biological rhythms and established new techniques to maintain human performance in around-the-clock operations.

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(U) FY 1993 Planned Program:

- (U) Study the pharmacokinetics and mechanisms for metabolic transformation to non-harmful compounds.
- (U) Investigate new microbial degradation schemes for restoration of contaminated sites and clean up of chemical spills resulting from Air Force operations.
- (U) Examine the mechanisms underlying attention, working memory, and long-term memory in order to provide neural models for machine intelligence.
- (U) Research the mechanisms utilized by the brain to initiate changes in state along a continuum from sleep to arousal to attentiveness.

(U) FY 1994 Planned Program:

- (U) Research molecular biological techniques to solve intracellular regulatory questions about circadian timing mechanisms.
- (U) Begin physiological and neurochemical investigations of the brain's mechanisms for responding to episodes of G-induced loss of consciousness.
- (U) Continue research to determine the basic mechanisms of toxic chemical and radiation insults.
- (U) Determine the mechanisms involved in retinal damage induced by ultrashort laser pulses in the visible and near-infrared regions of the electromagnetic spectrum.

(U) Work Performed By: Armstrong Laboratory, Brooks AFB, TX, and Wright Laboratory, Wright-Patterson AFB, OH, conduct research under this project. The top contractors or universities are: Hahnemann University, Philadelphia, PA; University of Illinois, Urbana, IL; Massachusetts Institute of Technology, Cambridge, MA; University of Wisconsin, Madison, WI; and Yale University, New Haven, CT.

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

13. (U) Project 2313, Human Performance: This project supports basic research on the human capability to process information quickly and accurately. Such research supports Air Force technology needs for personnel selection, classification, and training, and for the design of modern systems for human machine interfaces or artificial intelligence and signal processing. The project includes research on vision, hearing, spatial orientation, computational neuroscience, cognition, and intelligent tutoring systems. Vision research includes surface perception and pattern recognition. Hearing research includes studies of sound source segregation, localization, and recognition, including speech sounds. Spatial orientation includes studies of vestibular and multisensory effects

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on the human ability to navigate and to orient in dynamic environments. Computational neuroscience includes study of biological neural networks as information processors. Cognition research focuses on attention, memory, decision-making, and expert performance. Study of tutoring systems considers the efficacy of modern instructional techniques and their interactions with student abilities to determine rate of learning and level of retention.

(U) FY 1992 Accomplishments:

- (U) Applied a human learning and decision-making model to problems in the management of large databases used to describe parts used in the design of aircraft.
- (U) Developed new heuristic techniques for processing synthetic aperture radar (SAR) image data and algorithms for robotic systems.
- (U) Utilized research results on hearing and sound source localization to the design of virtual reality systems.
- (U) Employed individual differences in mental ability in a large-scale evaluation of new tests for selection and classification.

(U) FY 1993 Planned Program:

- (U) Focus vision and hearing research on sensory pattern recognition efforts.
- (U) Begin vestibular stimulation studies for spatial orientation research.
- (U) Begin cognition research on team communication in tasks of command and control.

(U) FY 1994 Planned Program:

- (U) Research team performance to emphasize cognitive, structural, and social factors in workstation design.
- (U) Investigate team member fatigue and stress to determine optimum performance environments for command, control, and communications.
- (U) Model human performance using computer algorithms for application to virtual environments/workstation design.
- (U) Conduct cognition research to address complex decision-making.

(U) Work Performed By: Armstrong Laboratory, Brooks AFB, TX, conducts research under this project. The top contractors or universities are: University of California, Berkeley, CA; New York University, New York, NY; Harvard University, Boston, MA; University of Pennsylvania, Philadelphia, PA; and Boston University, Boston, MA.

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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14. (U) Project 4113, Science and Engineering Education Programs: This project supports various programs whose overall purpose is to stimulate scientific and engineering education and to increase the interaction between the broader research community and the Air Force laboratories. Special emphasis is placed on increasing the number of U.S. citizens, especially women and minorities, with advanced degrees in science and engineering. These programs include: the *Summer Faculty Research Program* under which selected university faculty members conduct research at Air Force labs; the *Graduate Student Research Program* where graduate students in areas of interest to the Air Force perform research at Air Force labs; the *University Resident Research Program* where faculty members spend one year at an Air Force lab familiarizing themselves with Air Force research needs and operations; the *U.S. Air Force National Research Council (RC) Resident Research Associateship Program* which provides postdoctoral and senior scientists and engineers opportunities to research problems of their own choice that are compatible with the research interests of selected Air Force labs; the *Laboratory Graduate Fellowship Program* which is designed to stimulate doctoral candidate interest in Air Force labs and the research programs of those labs; and the *National Defense Science and Engineering Graduate Fellowship Program* which is jointly sponsored by the Army, Navy, Air Force, and the Advanced Research Projects Agency for the purpose of increasing the number of U.S. citizens trained in science and engineering.

(U) FY 1992 Accomplishments:

- (U) The *Summer Faculty Research Program* supported 183 university faculty for up to 12 weeks at Air Force labs. The *Graduate Student Research Program* supported 131 students for up to twelve weeks at Air Force labs. Ten percent of these Summer Research Program participants are members of a historically black or minority college.
- (U) The *University Resident Research Program* supported 25 university researchers.
- (U) The *National Research Council Resident Research Associateship Program* supported 48 fellows, divided evenly between senior and post-doctoral researchers.
- (U) The *Laboratory Graduate Fellowship Program* supported 83 fellows.
- (U) The *National Defense Science and Engineering Graduate Fellowship Program* supported approximately 95 fellowships with ten percent set aside for members of ethnic minority groups under-represented in science and engineering.

(U) FY 1993 Planned Program:

- (U) This program will support approximately the same number of personnel as in FY 1992.

(U) FY 1994 Planned Program:

- (U) This program will support approximately the same number of personnel as in FY 1993.

(U) Work Performed By: Not Applicable.

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Program Element: #0601102F
PE Title: Defense Research Sciences

Budget Activity: #1 - Technology Base

- (U) Related Activities:
 - (U) PE 0601103D, University Research Initiative.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 15. (U) Project 4161, Defense Business Operations Fund: This project provides the funding required to the pay the Air Force portion of the operating costs of the Defense Technical Information Center (DTIC) and the 14 Information Analysis Centers which are administered by DTIC.
 - (U) FY 1992 Accomplishments: Not Applicable.
 - (U) FY 1993 Planned Program:
 - (U) Funding will be provided to DTIC on a monthly cycle of billing and reimbursement at a rate of one-twelfth of the total each month.
 - (U) FY 1994 Planned Program:
 - (U) Funding will be provided to DTIC on a monthly cycle of billing and reimbursement at a rate of one-twelfth of the total each month.
- (U) Work Performed By: Not Applicable.
- (U) Related Activities: Not Applicable.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 16. (U) Project 4284, Advanced Optical System: This project was created to execute a Congressionally-directed FY 1993 program for a competitive grant establishing an astronomy-oriented science center.
 - (U) FY 1992 Accomplishments: Not Applicable.
 - (U) FY 1993 Planned Program:
 - (U) A competitive award is expected to be made in the fourth quarter of FY 1993.
 - (U) FY 1994 Planned Program: Not Applicable.
- (U) Work Performed By: Not Applicable.
- (U) Related Activities: Not Applicable.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602101F
PE Title: Geophysics

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06GL Laboratory Operations	24,535	25,594	19,730	Cont	TBD
3054 Infrared Target and Background Signatures	2,051	1,613	1,468	Cont	TBD
4087 Plasma Effects on Sensors and Signatures	225	795	747	Cont	TBD
4238 Geophysics for Synthetic Environments	0	0	600	Cont	TBD
4643 Ionospheric Specification	2,285	1,861	1,825	Cont	TBD
6670 Atmospheric Science and Technology	1,176	1,202	909	Cont	TBD
7600 Terrestrial Geophysics	653	672	474	Cont	TBD
7601 Space Effects on Air Force Systems	4,705	2,955	2,494	Cont	TBD
7659 Aerospace Systems Technology	594	597	537	Cont	TBD
7670 Optical/Infrared Properties of the Environment	1,913	1,692	1,468	Cont	TBD
Total	38,137	36,981	30,252	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: From satellite-damaging space radiation to engine-clogging desert sandstorms, the geophysical environment often limits the warfighting capabilities of our nation's aerospace forces. This Science and Technology program develops the capability for Air Force weapon, communication, and surveillance systems to withstand the effects of the hostile natural environment within which they must operate. This includes environmental modeling and simulation programs to enhance military system design capabilities in the conceptual development phase. Development efforts are also included in this element that will directly contribute to the environmental quality needs of the Air Force. This work is extensively coordinated outside the Air Force with other government agencies resulting in extensive collateral support to non-Air Force and non-DOD programs, ensuring effectiveness of joint efforts, and precluding duplication.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06GL, Laboratory Operations: This project provides for management, support, and operation of the Geophysics Directorate of Phillips Laboratory, at Hanscom AFB, MA, and three locations stateside. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and facility services. This project supports and complements all projects in this program element.
2. (U) Project 3054, Infrared Target and Background Signatures: Air Force surveillance, warning, tracking, and guidance systems must be able to detect targets against the natural infrared, visible, and ultraviolet background. The general nature and detailed character of this background may compromise system performance. This project characterizes the infrared, visible, and ultraviolet signatures of

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PE Title: Geophysics

Budget Activity: #1 - Technology Base

the celestial and the natural and disturbed (nuclear) atmospheric backgrounds and develops physical models to interpret and predict these signatures and associated computer models for use in system design and performance analysis.

(U) FY 1992 Accomplishments:

- (U) Completed data analysis for the Spacecraft Kinetic Infrared Test (SKIRT) shuttle glow experiment and published report.
- (U) Delivered infrared version of the celestial background scene descriptor code for use in the spectral scene generator model.
- (U) Distributed the line-by-line radiance and transmission code, Fascode3P, to approximately 160 DOD and other government agency groups involved in electro-optical systems design and operations.
- (U) Designed an optical background and transmission code tailored for use as a system design tool.

(U) FY 1993 Planned Program:

- (U) Initiate expansion of the celestial background scene descriptor code to visual and ultraviolet wavelengths.
- (U) Complete the initial version of the expert unified simulator code for use as a user-friendly interface with which to properly manage sophisticated background and transmission codes.
- (U) Continue the SKIRT shuttle glow experimentation.
- (U) Develop an improved solar scattering model for the lower atmospheric radiance and propagation codes.
- (U) Assess the Cloud Radiance Infrared Simulation (CLDSIM) model.

(U) FY 1994 Planned Program:

- (U) Complete and distribute Version 1.0 of the expert unified simulator code.
- (U) Develop stellar atlas for in situ calibration of DOD infrared sensor systems.
- (U) Flight demonstrate the SKIRT shuttle glow sensor.
- (U) Incorporate a minor species concentration profile generator for all altitudes in the radiance and transmission codes.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are: Atmospheric Environmental Research, Cambridge, MA; Spectral Sciences, Inc., Burlington, MA; General Research, Danvers, MA; Mission Research, Nashua, NH; and Jamieson Science and Engineering, Scotts Valley, CA.

(U) Related Activities:

- (U) 0305160F, Defense Meteorological Satellite Program.
- (U) 0601102F, Defense Research Sciences.
- (U) 0603707F, Weather Systems Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4087, Plasma Effects on Sensors and Signatures: The purpose of this project is to evaluate interactions between reentering aerospace systems and the environment. Specific efforts include the effects of plasmas on avionics, communications systems,

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Program Element: #0602101F
PE Title: Geophysics

Budget Activity: #1 - Technology Base

and signatures of aerospace vehicles during reentry, and on chemical techniques for modifying plasmas.

(U) FY 1992 Accomplishments:

- (U) Conducted first measurements of ion-molecule reaction rates in the new high temperature flow tube facility.
- (U) Discovered indications of mid-temperature surface plasma sources.
- (U) Performed initial testing and evaluation of the new high temperature flow tube facility.
- (U) Measured reaction rates for candidate alleviants using selected ion flow drift tube apparatus.

(U) FY 1993 Planned Program:

- (U) Use mass spectrometric techniques to analyze the plasma ion composition associated with ablation of selected antenna window and heat shield materials using a high temperature flow tube facility.
- (U) Measure reaction rates for species important in antenna window ablation using an ion flow drift tube apparatus.
- (U) Assess radio frequency (RF) transmission characteristics of antenna window materials using a plasma arc.
- (U) Update computer flowfield models with modern chemistry data and RF propagation treatments.

(U) FY 1994 Planned Program:

- (U) Develop chemical plasma modification techniques to improve performance of on-board guidance sensors.
- (U) Test RF transmission performance of antenna window materials using a plasma arc.
- (U) Continue effort to validate flowfield computer code which includes RF propagation through plasma.
- (U) Modify Air Force prediction models to include new measured plasma effects on-board antennas and sensors.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are yet to be determined.

(U) Related Activities:

- (U) 0603402F, Space Test Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4238, Geophysics for Synthetic Environments: The Air Force needs the capability to simulate the physical environment and its effects in order to mitigate and/or exploit the environmental impact on system performance and operations. This project consolidates modeling and simulation efforts that have been underway and previously reported under Projects 3054, 4643, 6670, and 7601. The purpose of this consolidation is to develop and transition integrated and validated standard atmospheric and space representations to the DoD modeling and simulation community for use from system concept explorations to operators. It determines requirements through active participation in major DOD modeling and simulation activities as indicated in Related Activities below, modifies existing environmental representations to meet simulation requirements, directs development of new environmental

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PE Title: Geophysics

Budget Activity: #1 - Technology Base

representations to meet unsatisfied requirements, and verifies and validates environmental representations to meet accreditation standards.

(U) FY 1992 Accomplishments: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Develop an infrared propagation simulation capability in the Joint Modeling and Simulation System (J-MASS).
- (U) Formulate a static radiation belt simulation code.
- (U) Formulate an air-to-air, cloud-free, line-of-sight climatology simulation code.
- (U) Validate the Cloud Radiance Infrared Simulation model.
- (U) Develop the theater cloud humidity and precipitation field code.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are TBD.

(U) Related Activities:

- (U) Defense Modeling and Simulation Office (DMSO).
- (U) Joint Modeling and Simulation System (J-MASS).
- (U) Distributed Integrated Simulation (DIS).
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4643, Ionospheric Specification: The ionosphere imposes severe constraints on the operation of Air Force communication and surveillance systems. This project develops the capability to predict, mitigate, and exploit ionospheric effects on Air Force systems. This project also enhances research in environmental protection and damage mitigation.

(U) FY 1992 Accomplishments:

- (U) Transitioned new measurements and techniques for real-time specification of command, control, and communications systems outage.
- (U) Assessed potential to enhance the performance of communication systems through high-power ionospheric heating.
- (U) Measured low latitude meteor burst propagation for survivable communications.
- (U) Transitioned the 90-140 kilometer density data to the Air Force Space Forecast Center (AFSFC).

(U) FY 1993 Planned Program:

- (U) Validate ionospheric specification models for the AFSFC.
- (U) Launch Atmospheric Density Specification (ADS) experiment on the Space Test Program STEP-1 launch.
- (U) Complete ultraviolet radiance codes and incorporate into existing scene generation models.
- (U) Deliver equatorial scintillation model upgrade to AFSCF.
- (U) Develop Integrated Ionospheric/Space Environment Simulation Shell.

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(U) FY 1994 Planned Program:

- (U) Validate real-time ionospheric forecast model.
- (U) Establish source data base for plasma disturbances in polar command, control, and communications.
- (U) Determine precursors to equatorial disturbances.
- (U) Validate Defense Meteorological Satellite Program (DMSP) ultraviolet (UV) sensor algorithms with the Atmospheric Density Specification satellite density measurements.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are: Northwest Research Associates, San Diego, CA; University of Lowell, Lowell, MA; University of Michigan, Ann Arbor, MI; Emmanuel College, Boston, MA; and Canadian Commercial Corp., Ottawa, Canada.

(U) Related Activities:

- (U) 0102417F, Over-the-Horizon Backscatter Radar Program.
- (U) 0305160F, Defense Meteorological Satellite Program.
- (U) 0601102F, Defense Research Sciences.
- (U) 0603402F, Space Test Program.
- (U) 0603707F, Weather Systems Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 6670, Atmospheric Science and Technology: Military operations require reliable forecasts of mission-limiting weather conditions to be successful. This project develops descriptive and predictive models of the atmosphere from global to microphysical scales and techniques to accurately measure atmospheric parameters worldwide.

(U) FY 1992 Accomplishments:

- (U) Installed real-time ingest and data handling of DMSP and National Oceanographic and Atmospheric Administration (NOAA) polar-orbiting satellite data.
- (U) Tested, evaluated, and began transition of the advanced physics version of the Air Force global prediction model.
- (U) Successfully tested three rocket electric field sensors to measure electric fields in clouds for triggered lightning prediction.
- (U) Transitioned computer version of world atlas of cloud statistics.

(U) FY 1993 Planned Program:

- (U) Complete electronic data board access to Cloud Reference Library.
- (U) Complete computer-based atlas of global cloud statistics.

(U) FY 1994 Planned Program:

- (U) Develop theater-scale weather prediction model capable of high resolution cloud, precipitation, and wind forecasts.
- (U) Characterize tropospheric impacts on laser propagation.
- (U) Develop cloud analysis model based on geostationary/polar satellite sensor data.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory,

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PE Title: Geophysics

Budget Activity: #1 - Technology Base

Hanscom AFB, MA. The contractors are: AER, Cambridge, MA; Augsburg College, Minneapolis, MN; Science and Technology Corp., Hampton, VA; TASC, Reading, MA; and ST Systems Technologies, Inc., Lanham, MD.

(U) Related Activities:

- (U) 0305160F, Defense Meteorological Satellite Program.
- (U) 0601102F, Defense Research Sciences.
- (U) 0603707F, Weather Systems Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 7600, Terrestrial Geophysics: New superconductors and superfluids combined with improved models of the earth's gravity field promise a revolutionary breakthrough in reaching the goal of a fully-autonomous inertial system for precise navigation, guidance, and pointing. This project develops technology in the areas of the earth's geometry, motion, gravity, and seismology for Air Force strategic and tactical systems.

(U) FY 1992 Accomplishments:

- (U) Completed several improvements to the Model II Superconducting Six-axis Accelerometer (SSA) and developed an improved calibration scheme.
- (U) Integrated a high accuracy ring laser gyro with the Model II Superconducting Gravity Gradiometer and performed a very successful test of the inverse square law of gravitation.
- (U) Completed data analysis on the variability of ground motion at closely spaced locations.
- (U) Completed Global Positioning System (GPS)/Inertial Measurement Unit (IMU) integrated data algorithm for the GPS-aided inertial system experiment.

(U) FY 1993 Planned Program:

- (U) Deliver design for Superconducting Tensor Gravity Gradiometer for autonomous inertial navigation applications on the stabilized test stand.
- (U) Initiate program to further develop the SSA for airborne and spaceborne gravity measurement and compensation applications.
- (U) Determine physical models to validate ground motion variability models.
- (U) Continue developing new generation GPS spaceborne receiver technology for the GPS-aided inertial system experiment.

(U) FY 1994 Planned Program:

- (U) Install the modified SSA on the Seismically Stable Platform (SSP) and implement a three-axis closed loop control for the SSP.
- (U) Conduct tests to understand the implications of wave scattering on seismic discrimination and yield estimation capabilities.
- (U) Perform GPS/IMU gravity extraction feasibility study.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are: University of Maryland, College Park, MD; Boston College, Chestnut Hill, MA; Mayflower

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PE Title: Geophysics

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Communications Corp., Reading, MA; and Ohio State University, Columbus, OH.

(U) Related Activities:

(U) 0601102F, Defense Research Sciences.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 7601, Space Effects on Air Force Systems: Air Force space operations require models, forecasts, and measurements of the solar/space environment and the impact of this hazardous environment on military systems. This project develops technology to increase the reliability and survivability of systems operating in this hostile environment. Techniques are developed to measure and characterize the highly dynamic space environment and to develop techniques for the mitigation of systems degrading interactions on Air Force navigation, positioning, and communication systems. The space technology base generated by the project is crucial to the design of next generation survivable, affordable, and autonomous space systems. The project establishes the feasibility of state-of-the-art detectors for space operations and for global space weather alerts.

(U) FY 1992 Accomplishments:

- (U) Completed static radiation belt data base from the Combined Release and Radiation Effects Satellite (CRRES) data.
- (U) Transitioned CRRES results on micro-electronic single event upsets.
- (U) Completed solar mass ejection imager conceptual design for optics and baffle system.
- (U) Launched sensors for space plasma density and temperature, energetic particles, and electric and magnetic fields measurements.

(U) FY 1993 Planned Program:

- (U) Complete static radiation dose model of radiation belt.
- (U) Complete Mark II Active Mirror to increase resolution of solar observations at Sacramento Peak Observatory.
- (U) Complete design of upgraded sensors for space plasma density and temperature, energetic particles, and electric fields.

(U) FY 1994 Planned Program:

- (U) Complete static electron and proton radiation belt models.
- (U) Complete and deliver the upgraded sensors for Defense Meteorological Ssatellite Program S-16 and S-17.
- (U) Initiate development of a geomagnetic storm alert sensor.
- (U) Initiate development of high energy space radiation detectors.

- (U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The Naval Research Laboratory, Washington, DC, provides support. The contractors are: Boston College, Chestnut Hill, MA; Spectral Sciences, Inc., Burlington, MA; University of California, Berkeley, CA; S-Cubed, La Jolla, CA; and Massachusetts Technological Laboratory, Inc., West Newton, MA.

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Budget Activity: #1 - Technology Base

- (U) Related Activities:
 - (U) Combined Release and Radiation Effects Satellite is a joint NASA/DOD program.
 - (U) 0102431F, Defense Support Program.
 - (U) 0305160F, Defense Meteorological Satellite Program.
 - (U) 0601102F, Defense Research Sciences.
 - (U) 0603402F, Space Test Program.
 - (U) 0603410F, Space Systems Environmental Interactions Technology.
 - (U) 0603438F, Satellite Systems Survivability.
 - (U) 0603707F, Weather Systems Advanced Development.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 9. (U) Project 7659, Aerospace Systems Technology: This project improves the usefulness of spacecraft, balloon, and sounding rocket payloads used by the Phillips Laboratory and DOD. The work applies modern technology, particularly microelectronics, in developing experimental sensor platforms and efficient data management.
 - (U) FY 1992 Accomplishments:
 - (U) Completed video image data compression study.
 - (U) Completed initial tests of a Totally Integrated Payload Attitude Control Tester (TIPACT) for a 1000 pound payload.
 - (U) FY 1993 Planned Program:
 - (U) Complete development and testing of a balloon-borne Global Positioning System (GPS) navigation receiver.
 - (U) Flight test a new super-pressure balloon with special flight instrumentation to verify performance.
 - (U) Study and develop a means to compress data used for quick look and real-time assessment of payload launch readiness.
 - (U) FY 1994 Planned Program:
 - (U) Complete ground support equipment (GSE) interface with aerospace science payloads to compress data enhancing ability to assess launch readiness.
- (U) Work Performed By: This project is managed by and is the technical activity of the Space Experiments Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are: Wentworth Institute of Boston; Systems Integration Engineering, Inc. (SIE), Lexington, MA; and Northeastern University, Boston, MA.
- (U) Related Activities:
 - (U) 0305160F, Defense Meteorological Satellite Program.
 - (U) 0601102F, Defense Research Sciences.
 - (U) 0603402F, Space Test Program.
 - (U) 0603410F, Space Systems Environmental Interactions Technology.
 - (U) 0603707F, Weather Systems Advanced Development.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 10. (U) Project 7670, Optical/Infrared Properties of the Environment: The

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PE Title: Geophysics

Budget Activity: #1 - Technology Base

Air Force needs the capability to remotely sense atmospheric properties that affect electro-optical systems and also needs physical models that predict atmospheric effects on systems and operations. Additional requirements include the characterization of aircraft and certain missile target signatures from airborne systems in flight. This project develops: (1) lidar technology to measure atmospheric properties from space; (2) tools to predict the impact of the atmosphere on DOD systems; and (3) airborne infrared instrumentation, inflight techniques for target signature observations, and models to predict the infrared signatures of untested targets.

(U) FY 1992 Accomplishments:

- (U) Completed compendium of aerosol backscatter measurements obtained at test sites in the Atlantic regions.
- (U) Completed three-year study of global aerosol distributions.
- (U) Completed analytic evaluation of dual-beam turbulence sensor.

(U) FY 1993 Planned Program:

- (U) Deliver eyesafe two micron lidar system for aircraft.
- (U) Initiate development of interface model for the Spectral Infrared Images of Targets and Scenes (SPIRITS) code.
- (U) Initiate windage profile field tests on missile trajectory accuracy, downward firing from airborne platforms.

(U) FY 1994 Planned Program:

- (U) Begin two-micron Doppler lidar field tests.
- (U) Field test laser turbulence sensor.
- (U) Conduct target signature field tests for the C-141.
- (U) Initiate operation of a lidar for pollution monitoring.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of Phillips Laboratory, Hanscom AFB, MA. The contractors are: University of Southern California, Los Angeles, CA; University of Arizona, Tucson, AZ; Photometrics, Inc., Woburn, MA; Sparta, Inc., Lexington, MA; Aerodyne, Inc., Billerica, MA; Stewart Radiance Laboratory, Bedford, MA.

(U) Related Activities:

- (U) 0305160F, Defense Meteorological Satellite Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602102F
PE Title: Materials

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06ML Laboratory Operations	28,465	29,198	24,924	Cont	TBD
2417 Thermal Protection Materials and Structures	2,626	3,610	4,265	Cont	TBD
2418 Metallic Structural Materials	14,205	17,372	17,674	Cont	TBD
2419 Nonmetallic Structural Materials	4,409	5,242	6,005	Cont	TBD
2420 Aerospace Propulsion Materials	3,964	4,745	5,314	Cont	TBD
2421 Fluids, Lubricants, and Elastomeric Materials	1,873	2,217	2,865	Cont	TBD
2422 Protective Coatings and Materials	3,148	3,835	4,012	Cont	TBD
2423 Electromagnetic Windows and Electronic Materials	4,614	5,549	5,746	Cont	TBD
4084 Strategic Missile Materials	<u>1,980</u>	<u>0,000</u>	<u>0,000</u>	<u>0,000</u>	<u>N/A</u>
TOTAL	65,284	71,768	70,805	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops materials and processing technologies, nondestructive inspection/evaluation technology, manufacturing processes, and provides material failure analysis. It is the primary source of advanced materials to reduce life cycle costs and improve performance, supportability, reliability, survivability, and affordability of current and future Air Force systems and support equipment. The program also provides management and operational support for the Materials Directorate, Wright-Patterson AFB, OH.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- (U) Project 06ML. Laboratory Operations: Provides management and operational support for the Materials Directorate, Wright-Patterson AFB, OH. Includes pay and benefits for civilian scientists, engineers, and support personnel; travel; transportation; rents; communications; utilities; supplies; and equipment.
- (U) Project 2417. Thermal Protection Materials and Structures: Develops advanced composite technologies including ablative and low dielectric materials for structural and thermal protection applications in aerospace systems and components which are exposed to extreme operating conditions (oxidizing environments of 2800°F to 4000°F, high Mach erosion, high stress levels). Typical aerospace systems and component applications include military gas turbine engines, solid rocket and space engine propulsion systems, reentry and penetration aid systems, space structures, and high Mach number aerodynamic vehicles. The advanced composites improve

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PE Title: Materials

Budget Authority: #1 - Technology Base

the accuracy and survivability of missiles, increase the thrust-to-weight ratio and specific fuel consumption of turbine engines, and increase the range, payload, and durability of high speed aircraft and missiles.

(U) FY 1992 Accomplishments:

- (U) Demonstrated survivable spacecraft thermal control coatings.
- (U) Transitioned intelligent composite manufacturing process control sensors to expendable turbine engines.
- (U) Demonstrated 500 hour oxidation life for coated composites in simulations of turbine engine exhaust environments.

(U) FY 1993 Planned Program:

- (U) Apply intelligent composite manufacturing process control to reducing material cost and processing time.
- (U) Define oxidative failure modes for composite materials.
- (U) Develop dimensionally stable composites with 20% weight savings over conventional aluminum spacecraft structures.

(U) FY 1994 Planned Program:

- (U) Evaluate material ablation performance for reentry vehicle structural antenna windows and shape predictable nose tips.
- (U) Explore low-cost processing techniques for low dielectric constant resins for missile radomes and aircraft structures.
- (U) Develop materials and processes for joining composites.
- (U) Develop models and sensors for processing techniques used in aircraft brakes and rocket nozzles.
- (U) Initiate development of lightweight, thermal protective composite materials for high temperature applications.

- (U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractors for this project are: Martin Marietta Astronautics Group, Denver, CO; and General Electric Company, Evendale, OH.

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2418. Metallic Structural Materials: Develops advanced metallic materials and metal matrix composites with optimum combination of properties from cryogenic temperatures to 1800°F (600°F increase in current capability) for use in aircraft, turbine engines, and missile primary structures. Develops the processes for the fabrication of these metallic materials. Investigates engineering properties and repair technologies and automated computer systems and databases to reduce weapon production costs. This project also provides failure analysis, repair and nondestructive inspection/evaluation (NDI/E) technologies to increase supportability and sortie generation.

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PE Title: Materials

Budget Authority: #1 - Technology Base

(U) FY 1992 Accomplishments:

- (U) Developed titanium aluminide alloys for matrix materials in Metal Matrix Composites (MMCs) with 1800°F capability.
- (U) Completed self-learning Quantitative Process Automation (QPA) system of computer-controlled curing of composite parts.
- (U) Completed development of joining/repair technologies for high temperature matrix composites for aircraft.
- (U) Conducted successful field tests for a Kapton wire insulation replacement.
- (U) Successfully completed final testing of non-flammable hydraulic fluid.

(U) FY 1993 Planned Program:

- (U) Complete coatings for protecting titanium aluminides at 1200°F.
- (U) Develop method to characterize a titanium alloy (Ti-6222) for use in advanced aircraft structural applications.
- (U) Complete eddy current nondestructive inspection (NDI) techniques to detect cracks under fasteners in aluminium structures.
- (U) Initiate efforts to detect hidden corrosion in structures.
- (U) Develop materials and processes to perform on-aircraft repair of large area damage on composite primary structures.
- (U) Initiate program to reduce hazardous and toxic materials and processes in the coating and painting of aircraft.

(U) FY 1994 Planned Program:

- (U) Optimize alloying and processing parameters for a 900°F aluminum alloy to replace conventional titanium.
- (U) Demonstrate corrosion detection sensors on Air Force aircraft.
- (U) Complete inspection techniques to identify internal structure and defects in complex cast turbine blades.
- (U) Initiate computer control techniques for coating processes used to deposit thermal barrier coatings on turbine blades.
- (U) Update selected Military Handbook 5 data which provides materials parameters required for system design.
- (U) Develop environmentally acceptable paints, primers, and coating systems for aircraft.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. Major contractors for this project are: Systran Corp., Dayton, OH; and Northrop Corp., Hawthorne, CA.

(U) Related Activities:

- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0708011F, Industrial Base Program.
- (U) DOD Metal Matrix Composite Steering Group.
- (U) Office of Science and Technology Committee on Materials Working Group on Nondestructive Materials.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0602102F
PE Title: Materials

Budget Authority: #1 - Technology Base

4. (U) Project 2419, Nonmetallic Structural Materials: Develops advanced organic matrix composite (OMC) materials with properties suitable for use over the temperature range from cryogenic temperatures to 700°F for aircraft, satellite, and missile structural applications. Emphasis is on constantly increasing strength, stiffness, temperature capability, and durability of OMCs as well as reducing weight and the costs to process them. This emphasis includes the development of signature reduction materials, ordered polymer films, and molecular composites. OMC materials have high strength-to-weight (specific strength) and stiffness-to-weight (specific stiffness) ratios compared to traditional metallics such as aluminum. These OMC materials will provide an additional 30-35% weight savings over current OMCs. These new materials can translate into a 50% weight savings over traditional structures.

(U) FY 1992 Accomplishments:

- (U) Transitioned thermoplastic composite technology for aircraft.
- (U) Transitioned ordered polymer film technology for lower cost, lightweight printed circuit boards.
- (U) Identified candidate aircraft canopy materials offering a 100°F increase in operating temperature performance.
- (U) Identified new processing methods for lowering the costs of making traditional tape laid composite structures.

(U) FY 1993 Planned Program:

- (U) Identify a hybrid composite construction that significantly improves the compressive strength of ordered polymer fibers.
- (U) Fabricate improved conductive polymers for photo diode development with application to optical signal processing.
- (U) Develop alternate processing (resin transfer molding) of polyimide aircraft structures with 20% reduced costs.
- (U) Demonstrate an Air Force developed 700°F resin on turbine engine exhaust flap components.

(U) FY 1994 Planned Program:

- (U) Demonstrate high temperature OMCs for currently fielded advanced aircraft.
- (U) Develop methods for fabricating a fuselage bulkhead for fighter aircraft out of thermoplastic composites.
- (U) Develop assembly procedures for high modulus graphite fiber with a thermoplastic matrix resin for space applications.
- (U) Develop new methods in fabricating rigid rod polymers for optical and electrical computing applications.

- (U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractors for this project are: the University of Dayton, Dayton, OH; Pratt & Whitney Aircraft, West Palm Beach, FL; and Northrop Corporation, Hawthorne, CA.

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

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Program Element: #0602102F
PE Title: Materials

Budget Authority: #1 - Technology Base

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2420. Aerospace Propulsion Materials: Develops advanced composites including ceramic matrix composites (CMCs), advanced intermetallic alloys, and metal matrix composites (MMCs), as well as the processes for fabricating these materials. These materials will be used to make lighter weight uncooled turbine engine components capable of operating in oxidizing environments at temperatures greater than 2800°F for the required service life. This project improves engine producibility, durability, life cycle costs, and fuel consumption.

(U) FY 1992 Accomplishments:

- (U) Transitioned extrusion and casting models to universities and industry.
- (U) Developed improved intermetallic matrix materials with room temperature damage tolerance and high temperature strength.
- (U) Demonstrated silicon carbide reinforcement for titanium MMC engine and aircraft structures.

(U) FY 1993 Planned Program:

- (U) Identify new ceramic fiber for reinforcing CMCs above 2200°F.
- (U) Evaluate the processing conditions for producing turbine engine components from advanced intermetallic MMCs.
- (U) Fabricate a CMC divergent nozzle flap for a turbine engine test.

(U) FY 1994 Planned Program:

- (U) Develop advanced intermetallic materials for 2000°F blade and vane applications without the use of cooling passages.
- (U) Demonstrate forgings of complex titanium aluminide components (turbine blades, compressor rotors).
- (U) Validate a model of the foil-fiber-foil process to produce MMCs for turbine engine bladed rings.
- (U) Demonstrate CMCs with low-observable and temperature capabilities for engine exhaust applications.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractors for this project are: Southern Research Institute, Birmingham, AL; and Universal Technology Corporation, Dayton, OH.

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 2421. Fluids, Lubricants, and Elastomeric Materials: Develops advanced fluids, lubricants, seals, sealants, and fluid containment technologies, together with an understanding of their behavior and performance. Improves the nonflammability and low

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PE Title: Materials

Budget Authority: #1 - Technology Base

temperature fluidity of fluids and lubricants. These materials are used in aircraft propulsion and hydraulic systems, spacecraft and missile propulsion systems, and spacecraft attitude control systems. This project develops the higher temperature lubricants and seals required by the higher operating temperatures of military turbine engines.

(U) FY 1992 Accomplishments:

- (U) Developed process of pulsed laser deposited solid lubricant films at significant cost savings.
- (U) Completed a moisture insensitive coolant material with higher contamination, corrosion, and freezing resistance.
- (U) Selected spacecraft thermal control coatings.
- (U) Developed a model to understand film stresses, friction, and wear in thin-layered solid lubricant films.

(U) FY 1993 Planned Program:

- (U) Determine constituents of 700°F engine oils (300°F increase in capability from previously developed fluids and additives).
- (U) Develop -60°F to 1500°F solid lubricants and different methods for applying them in advanced aircraft engines.

(U) FY 1994 Planned Program:

- (U) Identify an extended temperature range engine oil for environmental impact and engine study.
- (U) Demonstrate pulsed laser deposited coatings with a 200°F increase in operational temperature over current solid lubricants.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractor for this project is the University of Dayton, Dayton, OH.

(U) Related Activities:

- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 2422, Protective Coatings and Materials: Develops materials and protective coatings concepts to improve the survivability of aircrews and vital components of Air Force aircraft, missiles, and satellites in natural and threat environments. Materials developed in this project primarily have a protective function essential to the survival of the crew, avionics, and other critical subsystems. Types of materials developed include survivable thermal management materials for satellites which reduce the problem of contamination of spacecraft surfaces while enhancing survivability, camouflage and signature control coatings, and laser hardening materials and protective concepts. These protective materials ensure that Air Force aircrews and weapon systems can carry out their missions.

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PE Title: Materials

Budget Authority: #1 - Technology Base

(U) FY 1992 Accomplishments:

- (U) Completed molecular modeling efforts for advanced very rapid response non-linear optic (NLO) materials.
- (U) Developed low glint surface treatments for exterior aircraft canopy surfaces.
- (U) Developed novel molecular NLO materials for aircrew and sensor protective concepts against laser threats.

(U) FY 1993 Planned Program:

- (U) Complete a high quality, affordable optical filter for fixed wavelength protection for aircrews and sensors.
- (U) Validate holographic filter concepts for single laser wavelength night protection for aircrews.
- (U) Develop advanced binders and coatings for reduced aircraft signature.
- (U) Develop NLO materials for protective concepts against agile laser threats.

(U) FY 1994 Planned Program:

- (U) Demonstrate first generation broad band laser protection for aircrews and sensors.
- (U) Develop new predictive methods for performance of bio-engineered materials.
- (U) Develop processing of bio-materials as thin films.
- (U) Develop molecular modification of NLO materials to improve optical switching threshold.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractor for this project is Science Applications International Corp., San Diego, CA.

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Industrial Base Program.
- (U) Triservice Laser Hardened Materials and Structures Group.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 2423. Electromagnetic Windows and Electronic Materials:

Develops materials for microelectronic and microwave devices, infrared (IR) detectors, IR transparencies, and electronic packaging. These materials are essential for the development of reliable, very large scale integrated circuits and components, radio frequency and IR sensors, and communication and electronic warfare systems applicable to Air Force aircraft, missile, and space systems. Materials being developed for IR detectors will extend target detection capability. NLO materials being developed will offer faster switching speeds and signal processing. High temperature superconducting materials will offer vastly increased signal processing capability over conventional electronics at much higher temperatures than traditional superconductors. High durability infrared (IR) window materials will offer sustained supersonic flight survivability with resistance to rain, sand, and dust erosion.

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Program Element: #0602102F
PE Title: Materials

Budget Authority: #1 - Technology Base

(U) FY 1992 Accomplishments:

- (U) Produced largest ever ingots of uniform gallium arsenide (GaAs) for better yields and consistency in volume production of advanced detector arrays.
- (U) Demonstrated growth of multi-element infrared (IR) detector arrays of mercury cadmium telluride (MCT) for sensors.
- (U) Demonstrated coating for toughening IR transparencies and transitioned technology to advanced development programs.

(U) FY 1993 Planned Program:

- (U) Fabricate quality, ceramic high temperature superconducting thin films for electronic components.
- (U) Complete initial development of non-linear optic (NLO) material zinc germanium phosphide (ZGP) for agile IR laser sources.
- (U) Demonstrate growth of indium phosphide ingots for enhanced detector operating speeds and temperatures.
- (U) Demonstrate reproducible growth of MCT infrared detector layers.

(U) FY 1994 Planned Program:

- (U) Demonstrate high quality ZGP to the device community as new agile laser sources.
- (U) Optimize design of selected semiconductor structures through theoretical modeling for advanced detector applications.
- (U) Fabricate detector arrays in high temperature semiconducting materials to validate broad band IR sensor systems.
- (U) Characterize optical crystals for visible and ultraviolet wavelength conversion for optical countermeasures.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractor for this project is the University of Dayton, Dayton, OH.

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0602204F, Aerospace Avionics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 4084, Strategic Missile Materials: Develops constituent fibers/matrix resins and materials for reentry vehicle (RV) nose tips, antenna windows, leading edges, control surfaces, and thermal protection systems which are exposed to high Mach number erosion, ablation, and stresses at temperatures above 5000°F. Develops processes to make these materials and coatings to extend operational capability and penetrate enemy defense systems. This project has been terminated.

(U) FY 1992 Accomplishments:

- (U) Developed integrated nose tip/heatshield concepts for improved performance of advanced RVs.
- (U) Evaluated current nose tip materials in a high performance maneuvering reentry vehicle ablation environment.

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PE Title: Materials

Budget Authority: #1 - Technology Base

- (U) Implemented materials and processes for nose tips, antenna windows, high temperature control surfaces, and insulation.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The major contractor for this project was Sparta Inc., San Diego, CA.

(U) Related Activities:

(U) PE 0603112F, Advanced Materials for Weapon Systems.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602201E
PE Title: Aerospace Flight Dynamics

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06FF Directorate Operations	38,593	40,768	34,897	Cont	TBD
2401 Structures	4,551	5,772	7,049	Cont	TBD
2402 Vehicle Equipment	4,752	9,319	5,387	Cont	TBD
2403 Flight Control	10,245	6,412	8,420	Cont	TBD
2404 Aeromechanics	<u>4,796</u>	<u>5,627</u>	<u>8,485</u>	<u>Cont</u>	<u>TBD</u>
Total	62,937	67,898	64,238	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops the air vehicle technology base in aeromechanics, structures, flight control, cockpits, and vehicle subsystems to reduce the life cycle costs and improve the performance of existing and future air vehicles. These air vehicle technology programs provide the core investment in dual-role technologies that offer: increased reliability, maintainability, and supportability for air vehicles and subsystems; all-weather, day/night operations; and synthetic environments.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- (U) Project 06FF, Directorate Operations: This project provides for the management, support, and operation of the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB, OH. It provides for the pay and related costs for civilian scientists, engineers, and support personnel; transportation of equipment; communications and utilities costs; travel; and procurement of supplies, equipment, and support services.
- (U) Project 2401, Structures: This project creates more supportable and survivable aircraft structures. It investigates new structural concepts and design techniques which exploit new materials and fabrication processes to strengthen air vehicle structures while reducing weight and cost. This project also develops "smart" structures that will have embedded sensors to report stress, fatigue, and/or battle damage, leading to improved maintainability.

(U) FY 1992 Accomplishments:

- (U) Developed extreme temperature test methods to support design analysis of hydrogen-actively-cooled aerodynamic structures.
- (U) Completed fabrication of load bearing airframe structure with "smart" skin (e.g., embedded sensors that report fatigue, battle damage, etc.).
- (U) Developed improved methods for measuring the dynamic response of aircraft structures to sonic fatigue.
- (U) Developed damping technology to solve fatigue problems identified in aircraft.

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PE Title: Aerospace Flight Dynamics

Budget Activity: #1 - Technology Base

(U) FY 1993 Planned Program:

- (U) Integrate sensors with structural materials for "smart" airframe structures.
- (U) Develop automated design technology to design basic aircraft structural components.
- (U) Measure and characterize the vibration and acoustic environments of aircraft structures and weapons during flight.

(U) FY 1994 Planned Program:

- (U) Design a load bearing airframe structure with "smart" skin.
- (U) Demonstrate sensors and develop rapid data processing methods required for "smart" airframe structures.
- (U) Develop airframe structures and weapons mounting technology to damp the dynamic response to intense vibration.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH. The top five contractors are: Northrop, Hawthorne, CA; McDonnell Douglas, St. Louis, MO; General Dynamics (Lockheed), Ft. Worth, TX; Boeing, Wichita, KS; and Lockheed, Los Angeles, CA.

(U) Related Activities:

- (U) PE 0601101F, In-House Laboratory Independent Research.
- (U) PE 0602102F, Materials.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603269F, National Aero-Space Plane.
- (U) PE 0708026F, Producibility, Reliability, Availability, Maintainability.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2402, Vehicle Equipment: This project develops technologies to reduce subsystem and component life cycle cost, to improve vehicle and crew member survival in operational environments, and to improve subsystem performance for current and future flight vehicles.

(U) FY 1992 Accomplishments:

- (U) Developed design concepts for integrating air vehicle thermomanagement, flight control, and other subsystems to improve reliability and performance.
- (U) Developed technology and computer models for evaluating longer life aircraft tires to reduce life cycle costs.
- (U) Developed a thermal management computer design code for fighter aircraft (e.g., identified required type and size of cooling system for new subsystems and/or potential for integration into existing cooling systems).
- (U) Developed design/assessment methodology for increasing mechanical/electronic component life within aircraft subsystems.

(U) FY 1993 Planned Program:

- (U) Build and bench test a full-scale injection molded windshield which doubles windshield service life and reduces cost.

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Program Element: #0602201F
PE Title: Aerospace Flight Dynamics

Budget Activity: #1 - Technology Base

- (U) Develop laboratory durability test criteria to establish life prediction tools which will enable windshield cost of ownership savings.
 - (U) Evaluate breadboard gas generating system for dry bay and engine nacelle fire extinguishing.
 - (U) Provide computer upgrade, manpower, and testing material support to leverage the multi-agency halon replacement program for aviation.
 - (U) Develop Micro-encapsulated Phase Change Materials (MPCM) and demonstrate their ability to supply the necessary avionics cooling capacity required for current and future aircraft at less total system weight.
- (U) FY 1994 Planned Program:
- (U) Demonstrate thermal management design code's ability to identify solutions for heating/cooling problems in aircraft subsystems.
 - (U) Evaluate and select advanced cargo handling concepts for further development.
 - (U) Distribute, to contractors, an integrated computer-aided design code for aircraft transparencies.
 - (U) Demonstrate surface acoustic wave technology for non-destructive field evaluation of aircraft canopies.
 - (U) Complete initial evaluation of a no-false-alarm aircraft fire detection device.
 - (U) Complete initial durability assessment of abrasive resistant coating systems on a full-scale frameless transparency.
 - (U) Establish design criteria for fracture-resistant polycarbonate windshields.
 - (U) Continue testing of MPCM for avionics cooling.
- (U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB, OH. The top five contractors are: General Dynamics (Lockheed), Ft. Worth, TX; Garrett Corp., Torrance, CA; Canadian Commercial Corp., Ottawa, CN; McDonnell Douglas, St. Louis, MO; and Computer Technology Associates, Denver, CO.
- (U) Related Activities:
- (U) PE 0601101F, In-House Laboratory Independent Research.
 - (U) PE 0602202F, Human Systems Technology.
 - (U) PE 0603205F, Aerospace Vehicle Technology.
 - (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
 - (U) PE 0604212F, Aircraft Equipment Development.
 - (U) PE 0604609F, Reliability and Maintainability Technology Insertion Program.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
4. (U) Project 2403, Flight Control: This project develops technology to: (a) enable the pilot to get the most performance from the aircraft under all conditions; (b) provide the pilot with the display of information from on-board subsystems and off-board intelligence sources for increased situational awareness leading to enhanced mission performance and flight safety; (c) provide robust capability to control aircraft after damage and failures; and (d) network synthetic environments for simulation evaluation of advanced concepts.

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Program Element: #0602201E
PE Title: Aerospace Flight Dynamics

Budget Activity: #1 - Technology Base

(U) FY 1992 Accomplishments:

- (U) Completed simulation of "pathway" flight display (e.g., heads-up roadway depicting route to fly into and away from the target area).
- (U) Completed background attitude indicator evaluation, combining in a helmet-mounted display tactical information in the foreground with attitude information in the background.
- (U) Completed initial three-dimensional (3-D) cursor evaluation for target cueing and designation.
- (U) Established new flight control concepts to expand aircraft turning performance and increase agility/maneuverability.
- (U) Developed alternate effectors (flight controls) for vertical tailless fighters.
- (U) Conducted in-weather tower tests of millimeter wave (MMW) imaging radar for Passive Autonomous Landing System (PALS).

(U) FY 1993 Planned Program:

- (U) Develop standard set of flight maneuvers for evaluating the performance of highly maneuverable fighter aircraft.
- (U) Develop an aircraft flight control actuator with 80% fewer parts than current servoactuators.
- (U) Conduct in-weather flight tests of Platinum Silicide Infrared (IR) camera and ground test of MMW sensors for PALS.
- (U) Complete simulation test of Heads-Down Display Symbology for standardization of electronic displays.
- (U) Develop enhanced algorithm for high recognition speech voice control.

(U) FY 1994 Planned Program:

- (U) Validate local and distantly networked simulation capabilities (e.g., link weapons simulators at separate Air Force bases).
- (U) Demonstrate initial 3-D sound cueing (i.e., the pilot hears, through his/her helmet, a sound from the direction he/she should look) in a simulator.
- (U) Develop multi-spectral fusion algorithms for autonomous landing systems using IR and MMW sensors.
- (U) Complete simulation test of synthetic terrain image to enhance aircraft attitude and altitude awareness.
- (U) Develop advanced trainer cockpit to reduce transition training cost to operational aircraft.
- (U) Define pilot visual information requirements for encapsulated cockpit to enable flight while protected from laser injuries to pilots' eyes.

- (U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB, OH. The top five contractors are: McDonnell Douglas, St. Louis, MO; Northrop, Hawthorne, CA; Honeywell, Minneapolis, MN; Calspan, Buffalo, NY; and System Technology Corp., Dayton, OH.

(U) Related Activities:

- (U) PE 0601101F, In-House Laboratory Independent Research.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602301E, Defense Advanced Research Projects Agency.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603245F, Advanced Flight Technology Integration.
- (U) PE 0604237F, Variable Stability In-Flight Simulator Test Aircraft.

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Program Element: #0602201F
PE Title: Aerospace Flight Dynamics

Budget Activity: #1 - Technology Base

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 5. (U) Project 2404, Aeromechanics: This project develops aerodynamic design and airframe-propulsion integration technologies for current and future flight vehicles, focusing on speed regimes ranging from low to high Mach. These technologies have potential to reduce cost; improve range and payload to yield enhanced global force projection; and improve maneuverability while reducing observability to help pilots "kill and survive."
 - (U) FY 1992 Accomplishments:
 - (U) Developed database of aircraft geometries to enable use of emerging Computational Fluid Dynamics (CFD) tools.
 - (U) Developed design criteria to reduce twin nozzle screech, a severe acoustic problem, and eliminate damage caused by this vibration.
 - (U) Certified Euler CFD code for broad aircraft design application.
 - (U) Developed design criteria for a low-cost, low-observable (LO), lightweight vectoring exhaust nozzle (pitch and yaw).
 - (U) Developed advanced flow-control devices to improve maneuverability and enable design of tailless LO aircraft.
 - (U) Completed design of an advanced tilt-rotor transport configuration to enhance air mobility.
 - (U) FY 1993 Planned Program:
 - (U) Investigate wing/weapons integration to extend fighter aircraft combat range.
 - (U) Complete reacting gas database for CFD code validation.
 - (U) Complete configuration database for a supersonic LO tailless aircraft.
 - (U) Complete inlet boundary layer management database and design criteria to reduce signature.
 - (U) FY 1994 Planned Program:
 - (U) Develop elements of "Interdisciplinary Inverse CFD" methods to enable direct, requirement-driven air vehicles design.
 - (U) Develop high-speed boundary layer control technologies.
 - (U) Complete multiple-body CFD code for weapon separation and crew escape analysis.
 - (U) Complete design code for rapid generation and analysis of advanced integration aircraft configuration.
 - (U) Develop data base of current aircraft to enable use of emerging tools to respond to urgent user needs (e.g., quick redesign of aircraft components).
- (U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB, OH. The top five contractors are: McDonnell Douglas, St. Louis, MO; Boeing, Seattle, WA; Northrop, Los Angeles, CA; General Dynamics (Lockheed), Ft. Worth, TX; and Grumman Aerospace Corp., Bethpage, NY.
- (U) Related Activities:
 - (U) PE 0601101F, In-House Laboratory Independent Research.
 - (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
 - (U) PE 0603205F, Aerospace Vehicle Technology.

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Program Element: #0602201E
PE Title: Aerospace Flight Dynamics

Budget Activity: #1 - Technology Base

- (U) PE 0603245F, Advanced Flight Technology Integration.
- (U) PE 0603269F, National Aero-Space Plane.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602202F
PE Title: Human Systems Technology

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06MD Armstrong Laboratory Operations	30,333	32,498	27,621	Cont	TBD
2729 Nuclear, Biological, and Chemical (NBC) Defense	1,822	2,135	1,819	Cont	TBD
6302 Occupational and Environmental Toxic Hazards in Air Force Operations	2,759	4,843	3,043	Cont	TBD
6770 Human Technology Studies in Advanced Systems	883	1,480	1,400	Cont	TBD
6893 Manned Weapon Systems Effectiveness	838	948	885	Cont	TBD
7184 Man-Machine Integration Technology	6,056	6,787	6,175	Cont	TBD
7231 Safety and Aircrew Effectiveness in Mechanical Force Environments	2,415	3,144	2,719	Cont	TBD
7755 Aircrew Selection and Standards	10,837	1,490	1,053	Cont	TBD
7757 Radiation Hazards in Aerospace Operations	4,049	5,529	4,571	Cont	TBD
7930 Advanced Crew Technology	1,819	2,233	2,106	Cont	TBD
Total	61,811	61,087	51,392	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program focuses technology on the human interface with Air Force weapon systems to improve operator efficiency and weapon systems effectiveness. This technology is divided into four key areas: (1) improve operator performance by refining crew selection, crew protection, and man-machine integration; (2) improve operator safety by protecting personnel from radiation, chemical, and mechanical forces; (3) capitalize on human factors knowledge to invent countermeasures effective against enemy weapon systems operators; and (4) develop defense measures to protect air base operations. This technology will improve combat effectiveness by expanding the parameters which define the operationally safe performance limits.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- (U) Project 06MD, Armstrong Laboratory Operations: This project complements all other projects in this program element by providing for the management, support, and operation of the Aerospace Medicine, Crew Systems, and Occupational and Environmental Health Directorates of the Armstrong Laboratory. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; travel; transportation of equipment; rents; communications; utilities; laboratory supplies; unique equipment; and other related costs needed to conduct human systems exploratory technology development.
- (U) Project 2729, Nuclear, Biological, and Chemical (NBC) Defense: The goals of this project are to develop technology and procedures to address Air Force-unique needs in the areas of: operations analyses for NBC defense; detection, identification, and warning; contamination control; and individual/collective protection. This

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project will emphasize analysis and simulation/modeling studies of NBC defense. The project will also develop technologies with the Army in the areas of chemical and biological warfare agent detection and decontamination.

(U) FY 1992 Accomplishments:

- (U) Completed studies on heat stress while wearing Chemical/Biological Warfare (CBW) protective equipment; transferred effort to Army.
- (U) Developed CBW protective equipment scenarios and conducted simulations to predict the hazard from liquid and vapor C attacks on airbases.

(U) FY 1993 Planned Program:

- (U) Predict necessary detection and protection performance for CBW defense equipment for Air Force operations.
- (U) Improve the solid state detection and alarm technology provided to Desert Storm and explore technology for identification of biological warfare agents.
- (U) Develop techniques to assess the extent of decontamination required for contaminated pallets prior to placement inside cargo aircraft.

(U) FY 1994 Planned Program:

- (U) Develop techniques for evaluating various detection technologies for use inside cargo aircraft -- to permit alarm of contamination levels that might be dangerous to crew members.
- (U) Integrate biological detection and alarm technology with agent identification technology.
- (U) Develop decontamination procedures for cargo aircraft.
- (U) Develop a cargo aircraft interior detection technology.

(U) Work Performed By: In-house research and program management by Armstrong Laboratory, Brooks AFB, TX. Contractors are: Jaycor, San Diego, CA; Systems Research Laboratory, Dayton, OH; KRUG International, Dayton, OH; Rothe Development Inc., San Antonio, TX and Illinois Institute of Technology, Chicago, IL.

(U) Related Activities:

- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology
- (U) PE 0604703F, Aeromedical/Chemical Defense Systems Development
- (U) PE 0604706F, Life Support Systems.
- (U) PE 0604601F, CBW Defense Equipment.
- (U) PE 0702986F, Clothing Development.
- (U) This project has been coordinated with the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee and with the Joint Logistics Committee on Chemical/Biological Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 6302, Occupational and Environmental Toxic Hazards in Air Force Operations: This project develops technologies for toxicological research and assessment of Air Force materials and processes. It assesses human tolerance levels for chemicals, fuels, and materials to establish exposure criteria for designin

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new systems and performs trade off analyses between weapon systems performance and occupational health and environmental support requirements.

(U) FY 1992 Accomplishments:

- (U) Investigated metabolism and tissue toxicity of candidate Halon 1211 replacements to determine potential risk from occupational exposure.
- (U) Improved mathematical models of the distribution and actions of toxic compounds in the body by incorporating a mechanism for predicting cancer following exposure.

(U) FY 1993 Planned Program:

- (U) Conduct toxicological risk assessments of experimental replacement solid fuels with very high energy density.
- (U) Complete evaluation of the toxicological hazards of Halon 1211 replacements when used in fire control situations.
- (U) Investigate metabolism and toxicity of candidate Halon 1301 replacements to determine risk from occupational exposure.

(U) FY 1994 Planned Program:

- (U) Assess human risk from exposure to experimental replacement hydraulic fluids designed for high pressure applications in hot and cold environments.
- (U) Develop a model to predict health hazards from skin exposure to ground water contaminated with hazardous materials from Air Force operations.
- (U) Complete assessment of safe exposure levels for Halon 1301 replacement firefighting agents.

(U) Work Performed By: In-house research and program management by Armstrong Laboratory, Brooks AFB, TX. Contractors are: Mantech Environmental Technology Toxic Hazards Research Unit, Wright-Patterson AFB, OH; and Operational Technologies Corp., San Antonio, TX (SBIR).

(U) Related Activities:

- (U) PE 0602720A, Environmental Quality Technology.
- (U) PE 0602777A, Systems Health Hazard Prevention Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 6770, Human Technology Studies in Advanced Systems: This project provides scientific and technical support to in-house scientists from national scientific and technical organizations, committees, and tri-Service groups. This effort supports: (1) advisory groups for tri-Service coordination and review of programs and semi-annual reporting to higher headquarters on tri-Service research, development, and applications of human factors; (2) the National Academy of Sciences; and (3) coordinating agencies, and national and international resources, for compiling and disseminating information on laboratory animals.

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- (U) FY 1992 Accomplishments:
 - (U) Conducted studies on high power microwave bioeffects, loss-of-consciousness induced by high acceleration, and biophysical/mathematical models of functional vision.
 - (U) Supported pilot behavioral studies.
- (U) FY 1993 Planned Program:
 - (U) Expand the post-doctoral scientist programs in artificial intelligence for training, voice communications, and radiofrequency bioeffects.
 - (U) Develop a long-range strategic plan for study of the biological effects of high power microwaves.
- (U) FY 1994 Planned Program:
 - (U) Through the National Academy of Sciences, conduct a review of joint-Service requirements in aircrew escape at high speed.
 - (U) Develop a strategic plan for human interface technologies associated with operations of future unmanned vehicles.
- (U) Work Performed By: Managed by Armstrong Laboratory, Brooks AFB, TX. This is in-house only.
- (U) Related Activities: This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 5. (U) Project 6893, Manned Weapon Systems Effectiveness: This project focuses on two critical human senses in manned weapon systems; vision and motion perception. The goal is to determine weaknesses and strengths in these characteristics to assess effectiveness for visual countermeasures, and for air-to-ground, ground-to-air, air-to-air, and optical space-based operations.
 - (U) FY 1992 Accomplishments:
 - (U) Evaluated Camouflage, Concealment, and Deception (CC&D) techniques for fixed facilities (e.g., hangars).
 - (U) FY 1993 Planned Program:
 - (U) Develop and assess effectiveness of multi-spectral camouflage and masking patterns to improve survivability of aircraft parked on the ground.
 - (U) Finalize and qualify for space shuttle flight a vision function test device to investigate on-orbit changes in visual accommodation.
 - (U) FY 1994 Planned Program:
 - (U) Evaluate visual function test device in space shuttle flight.
 - (U) Test improved Blended Camouflage Net for hiding parked aircraft from air attack.
- (U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB, TX. The contractors are: Charles River Analytics Inc., Cambridge, MA; and Alphatech Inc., Burlington, MA.

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Budget Activity: #1 - Technology Base

(U) Related Activities:

- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0603227F, Advanced Simulator Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603245F, Advanced Fighter Technology Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 7184, Man-Machine Integration Technology: This project develops technologies to optimize interfaces between Air Force personnel and the weapon systems they operate. Information about the characteristics of human operators is gathered and analyzed to provide design data for system control and display development. The goal is to develop methods to simulate man's interface with machines and measure the changes in weapon effectiveness as a result of changes in "man-machine coupling."

(U) FY 1992 Accomplishments:

- (U) Integrated visual and audio display technologies to enhance air-to-air and air-to-ground mission effectiveness.
- (U) Developed cockpit lighting standard compatible with cargo aircraft night vision system to improve operator effectiveness.
- (U) Used new metrics to quantify aircrew mental workload.

(U) FY 1993 Planned Program:

- (U) Evaluate use of a simulation of command and control for strategic force management to assess strategic bomber/tanker force control and execution.
- (U) Develop a database of human head morphology for reliable helmet- and head-mounted equipment sizing and design.
- (U) Develop technologies to evaluate a weapon system operator's situational awareness as a metric for assessing crew system designs.

(U) FY 1994 Planned Program:

- (U) Evaluate advanced low-profile night vision goggle for specialized ground and flight crew operations.
- (U) Apply human engineering principles to cockpit design, training, and mission support to attack critical mobile targets.
- (U) Initiate development of helmet-mounted displays and controls to improve air-to-air situational awareness.
- (U) Enhance computer-aided design model of aircraft maintainer with estimates of time required for various repair tasks.

- (U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The major contractors are: Logicon, Torrance, CA; University of Dayton, Dayton, OH; Science Applications International Corp., San Diego, CA; Macaulay-Brown Inc., Dayton, OH; SRL, Dayton, OH; and KRUG International, Dayton, OH.

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Program Element: #0602202F
PE Title: Human Systems Technology

Budget Activity: #1 - Technology Base

(U) Related Activities:

- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0603227F, Advanced Simulator Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603245F, Advanced Fighter Technology Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 7231, Safety and Aircrew Effectiveness in Mechanical Force Environments: This project determines human response to mechanical forces including noise, impact, vibration, and hostile fire. This information is used for safe, effective escape/ejection systems, acceleration protection equipment, aircrew restraint devices, and for reducing crew station vulnerability. This project also develops data for operator-centered communications, jamming, noise exposure criteria, and telepresence techniques for remote operation of mechanical systems.

(U) FY 1992 Accomplishments:

- (U) Developed flight worthy hardware for three-dimensional audio display in fighter/attack aircraft.
- (U) Completed a mathematical model of noise levels from takeoff ground roll of current inventory aircraft to reduce the community impact of Air Force operations.

(U) FY 1993 Planned Program:

- (U) Incorporate new jamming effectiveness metric into communications effectiveness analysis and studies.
- (U) Develop active noise reduction headsets for enhanced air/ground crew communications and hearing protection.
- (U) Develop haul-back (inertial reel) design criteria for improving aircrew restraint systems.

(U) FY 1994 Planned Program:

- (U) Finalize human sensory feedback database to quantify techniques to remotely control equipment.
- (U) Demonstrate ability of three-dimensional audio system technology to provide target acquisition information.
- (U) Develop a simulation database for the Advanced Dynamic Anthropomorphic Manikin (ADAM) to assess injury potential of whole body impact and vibration.

(U) Work Performed By: This project is managed by Armstrong Laboratory, Brooks AFB, TX. The major contractors are: SRL Inc., Dayton, OH; Dyncorp, Albuquerque, NM; Sparta Inc., Laguna Hills, CA; Simula Inc., Phoenix, AZ; and Odetics Inc., Anaheim, CA.

(U) Related Activities:

- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0604703F, Aeromedical/Chemical Defense Systems Development.
- (U) PE 0604706F, Life Support System.
- (U) PE 0604601F, Chemical Biological Warfare Defense Equipment.

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- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603245F, Advanced Fighter Technology Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 7755, Aircrew Selection and Standards: The human operator is the enabling factor in all aerospace systems. The goal of this project is to optimize aircrew effectiveness through development of the understanding of: (1) medical conditions affecting aircrew selection and retention; (2) methods of early disease detection; (3) impact of disease on aircrew performance; and (4) therapeutic drug effects on flight safety.

(U) FY 1992 Accomplishments:

- (U) Tested the feasibility of allowing aircrew members to use rigid gas permeable contact lenses.
- (U) Published a ten-year report on the West Point study, a long-term cardiovascular study.

(U) FY 1993 Planned Program:

- (U) Implement new neuropsychiatric test standards to improve the accuracy of aeromedical evaluation of aircrew members.
- (U) Investigate echocardiography as a safe, non-invasive method to screen pilot candidates for structural heart defects.
- (U) Investigate compatibility of flying and a new cardiovascular drug as a treatment for hypertension.

(U) FY 1994 Planned Program:

- (U) Enhance diagnostic specificity and sensitivity of echocardiography for detecting structural heart defects.
- (U) Develop improved standards for ultra-violet vision protection devices.

- (U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The contractors are: Computer Data Systems Inc., San Antonio, TX (GSA contractor); SCEEE Services Inc., St. Cloud, FL; SRL Inc., Dayton, OH; and RDI, San Antonio, TX.

(U) Related Activities:

- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0604703F, Aeromedical/Chemical Defense Systems Development.
- (U) PE 0604706F, Life Support System.
- (U) PE 0604601F, Chemical Biological Warfare Defense Equipment.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 7757, Radiation Hazards in Aerospace Operations: This project develops technology for determining the effects and applications of electromagnetic and ionizing radiation in aerospace operations. Concerns include: safety; environmental impact;

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mission success and countermeasures in combat; and biologic effects of exposure to radiofrequency/microwave radiation, lasers, and ionizing radiation.

(U) FY 1992 Accomplishments:

- (U) Developed a mathematical analysis of femtosecond laser pulses for understanding hazards and applications of lasers.
- (U) Improved the mathematical formula which describes the interactions of microwaves with human tissue.

(U) FY 1993 Planned Program:

- (U) Improve ability to predict organ doses for setting standards of human exposure to microwave radiation.
- (U) Demonstrate proof of concept for a model to assess handheld laser weapon threats.

(U) FY 1994 Planned Program:

- (U) Establish safety standards for covert laser communications systems.
- (U) Evaluate the risk of cancer from lifetime exposure to Air Force-unique electromagnetic fields.
- (U) Assess cancer risks resulting from exposure to naturally-occurring radiation encountered in high altitude flight.
- (U) Develop microwave exposure safety standard.

(U) Work Performed By: This project is managed by Armstrong Laboratory, Brooks AFB, TX. The major contractors are: The Analytic Sciences Corp. (TASC), San Antonio, TX; Systems Research Laboratories, San Antonio, TX; University of Texas, San Antonio, TX; John B. Pierce Foundation, New Haven, CT; and Georgia Institute of Technology, Atlanta, GA.

(U) Related Activities:

- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 7930, Advanced Crew Technology: This project studies human response to physiological stressors such as rapid onset sustained acceleration, spatial disorientation, altitude and thermal stress, workload, and sustained operations. Design criteria and brass-board protective systems and procedures are developed to improve crew performance in this challenging environment. Additional task involve the evaluation, cockpit integration, and man-rating of this life support equipment.

(U) FY 1992 Accomplishments:

- (U) Improved sustained operations crew duty cycle to enhance crew performance.
- (U) Determined G-endurance of women as function of physical fitness and menstrual periodicity.

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- (U) FY 1993 Planned Program:
 - (U) Develop physiologic-based criteria for face mask pressure limits while using positive pressure breathing systems following rapid decompression.
 - (U) Develop acoustic orientation technology to enhance aircrew spatial awareness during combat operations.
- (U) FY 1994 Planned Program:
 - (U) Assess human time/tolerance to an acceleration of +12 Gs as a function of seat angle.
 - (U) Complete laboratory qualifications of a molecular sieve-based airborne oxygen system for use during aeromedical evacuation.
 - (U) Evaluate melatonin as sleep-aid and as a means of accelerating resynchronization of circadian rhythms.
- (U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The contractors are: Krug International, San Antonio, TX; SRL, Dayton, OH; Rothe Development Co., San Antonio, TX; Arthur D. Little, Cambridge, MA; and MOOG Inc., East Aurora, NY.
- (U) Related Activities:
 - (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
 - (U) PE 0604706F, Life Support System.
 - (U) PE 0604601F, Chemical Biological Warfare Defense Equipment.
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0603205F, Aerospace Vehicle Technology.
 - (U) PE 0603245F, Advanced Fighter Technology Integration.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602203F
PE Title: Aerospace Propulsion

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06PP Directorate Operations	24,853	25,788	21,949	Cont	TBD
3012 Ramjet Technology	5,083	5,396	6,442	Cont	TBD
3048 Fuels and Lubrication	10,349	9,267	10,312	Cont	TBD
3066 Turbine Engine Technology	19,997	21,652	28,145	Cont	TBD
3145 Aerospace Power Technology	<u>5,877</u>	<u>6,557</u>	<u>11,252</u>	<u>Cont</u>	<u>TBD</u>
TOTAL	66,159	68,660	78,100	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program element develops airbreathing propulsion and aerospace power technology. The prime areas of focus are turbine engines, ramjets, fuels and lubricants, and aerospace power technologies. Technology advances in turbine engine propulsion and lubrication systems will increase engine performance, reduce specific fuel consumption, and lower cost of ownership. Ramjet and combined cycle propulsion technologies will reduce the time to target for missiles to increase lethality and provide high Mach propulsion for rapid response. Fuels efforts will reduce system cost, maintenance, and the usage of hazardous cleaning materials while increasing aircraft performance and life through development of thermally stable and high heat sink fuels. Power system technologies are focused to eliminate troublesome, centralized hydraulic systems by replacement with highly reliable electric systems. Power conditioning, thermal management, and battery improvements will significantly enhance reliability, and reduce weight and life-cycle costs. Increased FY 1994 funding supports increased emphasis on turbine engine and aircraft electric power technologies.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06PP, Directorate Operations: Provides management and support for the Aero Propulsion and Power Directorate, Wright-Patterson AFB, OH. Includes pay and benefits for civilian personnel, travel, transportation, rentals, communications, utilities, and procurement of supplies and equipment.
2. (U) Project 3012, Ramjet Technology: Develops advanced propulsion concepts including: ducted rocket ramjets and solid fuel ramjets for missile propulsion providing increased average velocity and lethality; and combined cycle engines and hydrocarbon fueled dual mode combustion ramjets for high speed vehicles to support rapid strike.

(U) FY 1992 Accomplishments:

- (U) Fabricated fuel heat exchanger/reactor sector tailored for an air-core enhanced turborocket to permit the engine structure to withstand high combustion temperatures.
- (U) Designed and fabricated fuel injectors for high speed hydrocarbon fueled combustors.

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Program Element: #0602203F
PE Title: Aerospace Propulsion

Budget Activity: #1 - Technology Base

- (U) Completed full-scale, direct-connect boron solid fuel ramjet test to define performance at simulated flight conditions.
- (U) Selected air turborocket (ATR) solid fuel gas generator candidates. The ATR eliminates the need for a boost rocket in a ramjet missile allowing a 30% fuel reduction.
- (U) FY 1993 Planned Program:
 - (U) Fabricate an augmentor/ramburner sector and test endothermic fuel heat exchanger/reactor sector.
 - (U) Assemble, rig test, and optimize a hydrocarbon combustor fuel injector demonstrating cruise and accelerator capability for time urgent targets.
 - (U) Conduct ATR rig test to demonstrate solid fuel combustion/compatibility with turbine design for low-cost missiles.
 - (U) Select two integral rocket ramjet (IRR) gas generator fuels for passive throttling to reduce complexity and weight for tactical missiles along with a -65°F propellant for a nozzleless IRR booster.
- (U) FY 1994 Planned Program:
 - (U) Conduct augmentor/ramburner sector tests with an endothermic hydrocarbon fuel system.
 - (U) Rig test a high speed combustor for cruise/accelerator capability against time urgent targets or an airbreathing booster for Pegasus type missions.
 - (U) Complete ATR rig testing and develop a low-cost ATR design including the selected solid fuel and the turbine component.
 - (U) Complete design/fabrication of an air-core enhanced turbo-rocket combustor for high thrust/weight applications.
 - (U) Conduct ducted rocket combustor tests to select an increased energy density gas generator fuel and a passively throttled gas generator.
 - (U) Fabricate and structurally validate a composite inlet for weight limited ramjet applications.
- (U) Work Performed By: Both in-house and contract efforts are managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: Atlantic Research Corp., Gainesville, VA; General Electric, Evendale, OH; Pratt & Whitney, West Palm Beach, FL; Hughes Aircraft, Canoga Park, CA; Boeing Aerospace, Seattle, WA; Chemical Systems Division, San Jose, CA; and Hercules, McGregor, TX.
- (U) Related Activities:
 - (U) PE 0603216F, Aerospace Propulsion and Power Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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Program Element: #0602203F
PE Title: Aerospace Propulsion

Budget Activity: #1 - Technology Base

3. (U) Project 3048, Fuels and Lubrication: Develops advanced fuels, lubricants, and components for use in aircraft and missile engines. Conventional petroleum and alternate fuels are developed and evaluated for Air Force applications. Fuels and lubricants must be thermally stable, cost-effective, and operate at higher temperatures.

(U) FY 1992 Accomplishments:

- (U) Completed rig tests of candidate fuel additives to raise the upper operating temperature limit of JP-8 by 100°F (JP-8+100).
- (U) Developed diagnostic techniques to assess the thermal stability of high heat sink petroleum and coal-derived fuels.
- (U) Evaluated petroleum and coal-derived fuel candidates to provide a 500% increase in heat absorption over JP-8.
- (U) Demonstrated high speed bearing/seal technology with the capability for a 50% temperature and 25% speed increase.

(U) FY 1993 Planned Program:

- (U) Complete development of a powder lubricated hybrid ceramic ball bearing providing a 500-hour life capability.
- (U) Complete rig tests of a lightweight propfan gearbox with increased output horsepower for expendable missile engines.
- (U) Develop endothermic catalysts to elevate the heat sink capabilities of JP-10 and candidate JP-900 for high speed applications.
- (U) Rig test high speed, high temperature (1200°F) ceramic roller bearings for expendable missile engines.
- (U) Demonstrate a counter-rotating intershaft seal for large, man-rated engines to provide a 25% higher speed capability.
- (U) Rig test candidate high temperature, thermally stable fuels derived from coal.

(U) FY 1994 Planned Program:

- (U) Determine compatibility of JP-8+100 with fuel system materials.
- (U) Evaluate production feasibility of coal-derived fuel.
- (U) Complete engine validation testing of magnetic mainshaft rotor bearings.
- (U) Complete initial evaluation of a high temperature (625°F) liquid lubricant for advanced man-rated engine lube systems.
- (U) Complete development of a deflection pad thrust bearing for advanced turboshaft engines.
- (U) Define and initiate preliminary design of a turbofan demonstrator engine employing a magnetic bearing system for total mainshaft support.
- (U) Complete detailed design of a mainshaft rotor support magnetic bearing system for application in a long-life, man-rated turbofan engine.

- (U) Work Performed By: Both in-house and contract efforts are managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors for this project are: General Electric, Evendale, OH; United Technologies, East Hartford, CT, and West Palm Beach, FL; University

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Program Element: #0602203F
PE Title: Aerospace Propulsion

Budget Activity: #1 - Technology Base

of Dayton Research Institute, Dayton, OH; and Allied Signal, Energy and Materials Research Center, Chicago, IL.

(U) Related Activities:

(U) PE 0603216F, Aerospace Propulsion and Power Technology.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3066, Turbine Engine Technology: Develops technology to increase propulsion system operational reliability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. Analytical and experimental efforts are conducted in fans/compressors, high temperature combustors, turbines, internal flow systems, controls, exhaust systems, and structural design.

(U) FY 1992 Accomplishments:

- (U) Completed in-house testing of an enhanced flow compressor demonstrating full flight capability for subsonic/transonic/supersonic applications.
- (U) Completed structural testing of a metal matrix composite (MMC) bearing frame structure reducing weight by 40%.
- (U) Completed design of an advanced titanium MMC rear frame to include advanced stealth features.
- (U) Demonstrated an innovative nozzle actuator providing a higher temperature capability and 32% lower weight.
- (U) Completed turbine heat transfer studies which increased vane film effectiveness allowing higher turbine temperatures.

(U) FY 1993 Planned Program:

- (U) Verify aerodynamic and heat transfer design of a large engine turbine in the new in-house research facility.
- (U) Validate advanced silicon carbide electronics for turbine engine ignition/combustion detection sensor.
- (U) Validate a lightweight, high strength MMC rotor designed to increase durability and reduce life cycle costs.
- (U) Demonstrate concept feasibility of a high temperature combustor for missiles featuring a 35-50% volume reduction.
- (U) Demonstrate revolutionary turbine blade cooling technology at 600°F above state-of-the-art while meeting current life, reliability, and manufacturability requirements.

(U) FY 1994 Planned Program:

- (U) Test a low-cost brush seal design for operation in a high temperature, high pressure environment.
- (U) Rig test low-cost and long-life high film cooling effectiveness turbine airfoils for high specific thrust fighter engines and commercial/transport engines.
- (U) Assess probabilistic design tools and criteria for metal matrix and ceramic materials for multiple applications.
- (U) Rig test an advanced variable cycle core driven fan.

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Program Element: #0602203F
PE Title: Aerospace Propulsion

Budget Activity: #1 - Technology Base

- (U) Rig test a variable area turbine design.
 - (U) Design an "on demand" electric fuel delivery system, electric actuators, and an advanced electro-optic digital controller providing a 36% improvement in reliability.
 - (U) Utilize more-electric generator technology to design a fault-tolerant engine power distribution system providing a two-fold improvement in battle damage tolerance.
- (U) Work Performed By: Both in-house and contract efforts are managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: General Electric, Evendale, OH; Pratt & Whitney, West Palm Beach, FL, and East Hartford, CT; Allied Signal Propulsion Engines, Phoenix, AZ; Allison Gas Turbine, Indianapolis, IN; Williams International, Walled Lake, MI; and Teledyne CAE, Toledo, OH.
- (U) Related Activities:
- (U) PE 0602102F, Materials.
 - (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
 - (U) PE 0603216F, Aerospace Propulsion and Power Technology.
 - (U) PE 0602122N, Aircraft Technology.
 - (U) PE 0603210N, Aircraft Propulsion.
 - (U) PE 0603003A, Aviation Advanced Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
5. (U) Project 3145, Aerospace Power Technology: Develops technologies for aerospace batteries and power generation, conversion, and transmission systems including advanced electrical power component and subsystem technologies. Increased funding supports a major new initiative on the More-Electric Aircraft (MEA) which uses electrical power to replace hydraulic and pneumatic power and their costly logistics support.
- (U) FY 1992 Accomplishments:
- (U) Completed testing of second generation, higher reliability, high speed/high power switch for the MEA initiative.
 - (U) Fabricated a bread board power controller enabling a two-fold reliability increase and a 50% power density increase.
 - (U) Constructed a bread board radar power supply which will increase power density by 50%.
- (U) FY 1993 Planned Program:
- (U) Bread board test an electronics cooling system which nearly doubles power density and reliability of power controllers.
 - (U) Bread board test a solid state power controller for electric actuators enabling a two-fold improvement in power density.
 - (U) Design an internal turbine engine integral starter/generator providing a three- to five-fold improvement in reliability.

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PE Title: Aerospace Propulsion

Budget Activity: #1 - Technology Base

(U) FY 1994 Planned Program:

- (U) Design and construct a high performance electrical generator for an integrated power unit.
- (U) Construct and test bipolar lead-acid cells for 270 volt battery in support of the MEA initiative.
- (U) Fabricate advanced power semiconductor switches providing a 50% higher temperature capability and increased efficiency.
- (U) Design and develop modular power supplies with improved power quality and reduced electromagnetic interference providing more than a two-fold increase in power density.
- (U) Fabricate/instrument a full-scale internal engine integral starter/generator to eliminate accessory drive gearboxes.
- (U) Design critical more-electric power system components to replace environmentally undesirable hydrazine monopropellant and reduce aircraft ground support equipment.
- (U) Develop fault-tolerant more-electric power distribution system critical components including 50% higher power density motor drives with lower life cycle costs.

(U) Work Performed By: Both in-house and contract efforts are managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: General Electric, Schenectady, NY; Garrett, Phoenix, AZ; Leach, Los Angeles, CA; and Johnson Controls, Milwaukee, WI.

(U) Related Activities:

- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
06AA Laboratory Operations	40,070	41,627	37,232	Cont	TBD
2000 Active Electronic Countermeasures	2,943	2,941	3,166	Cont	TBD
2001 Electro-Optical Technology	2,283	2,378	2,551	Cont	TBD
2002 Microwave Technology	4,484	4,519	4,622	Cont	TBD
2003 Avionics System Design Technology	3,801	4,073	4,980	Cont	TBD
2004 Reconnaissance/Strike Electro-Optical Sensors	1,577	1,430	2,215	Cont	TBD
4080 Ballistic Missile Avionics	5,852	0	0	0*	5,852
6095 Inertial Reference and Guidance Technology	1,555	1,523	2,930	Cont	TBD
6096 Microelectronics Technology	3,374	3,532	3,549	Cont	TBD
7622 Reconnaissance/Strike Radio Frequency Sensors	2,494	2,449	3,894	Cont	TBD
7629 Fire Control Avionics	2,999	2,913	4,773	Cont	TBD
7633 Passive Electronic Countermeasures	2,666	2,698	3,163	Cont	TBD
7662 Avionics Data Transmission and Reception	740	852	1,760	Cont	TBD
Total	74,838	70,935	74,835	Cont	TBD

* Project terminated.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This exploratory development program conducts concept feasibility demonstrations and develops advanced technologies for Air Force avionics needs, to include target detection and classification, fire control, navigation, communication, jamming and deception of hostile defenses, architectures, signal/data processing, and electronic devices. Advances in avionics are needed multiply weapons effectiveness, enhance reliability, and reduce life cycle costs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06AA, Laboratory Operations: Provides for management and support of Wright Laboratory's Avionics and Electronics Technology Directorates, Wright-Patterson AFB, OH. It includes civilian personnel travel, utility costs, and building maintenance.

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PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

2. (U) Project 2000, Active Electronic Countermeasures: Develops and demonstrates technology to jam, deceive, or disable electronic threats throughout the electromagnetic spectrum. Advanced electronic countermeasures are required to degrade or deny a formidable enemy air defense threat capability.

(U) FY 1992 Accomplishments:

- (U) Demonstrated laser trackers in laboratory tests for on-board countermeasures.
- (U) Completed multispectral decoy design definition studies.
- (U) Defined technologies required for countermeasure decoys which will mimic an aircraft's distributed architecture.

(U) FY 1993 Planned Program:

- (U) Fabricate digital radio frequency memory (DRFM) based on DRFM-On-A-Chip technology using advanced digital architecture.
- (U) Evaluate radiation patterns of infrared flares tailored to match the aircraft they are designed to protect.
- (U) Develop advanced software algorithms to produce real-time spatial and temporal control of jamming energy.
- (U) Investigate signature manipulation techniques for countering imaging infrared seekers.

(U) FY 1994 Planned Program:

- (U) Evaluate advanced infrared flares that exploit color-balanced material and activated metal technologies.
- (U) Demonstrate improved countermeasures transmitter component performance using high-temperature superconductivity.
- (U) Derive techniques to jam communications links which are based on commercially available technology such as cellular networks.
- (U) Evaluate new mathematical concept (cyclostationary signal processing) for synthesis of correlated wideband communications jamming waveforms.
- (U) Evaluate electronic warfare antenna aperture designs for multi-purpose applications.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Lockheed-Sanders Corp., Nashua, NH; Hughes Aircraft Co., El Segundo, CA; ITT Corp., Nutley, NJ; Harris Corp., Melbourne, FL; and SRL Inc., Dayton, OH.

(U) Related Activities:

- (U) PE 0603270F, Electronic Combat Technology.
- (U) Joint Director of Laboratories, Technology Panel on Electronic Warfare, coordinates this program with the other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2001, Electro-Optical Technology: Develops and demonstrates low and medium power laser sources, image analysis optical pre-processing devices, and countermeasure, radar, imaging, warning, and weapon delivery systems detector/focal plane array technology. Improved electro-optical systems are required to increase engagement ranges and detect increasingly complex targets.

(U) FY 1992 Accomplishments:

- (U) Fabricated gallium arsenide-based long-wave infrared (IR) detectors for targeting sensor applications.
- (U) Investigated direct electrical excitation laser as revolutionary improvement for solid state laser efficiency

(U) FY 1993 Planned Program:

- (U) Demonstrate surface emitting diode as laser pumping source used in radar and IR countermeasures applications.
- (U) Apply gallium aluminum nitride heterojunction technology ultraviolet (UV) detectors for missile detection.
- (U) Demonstrate four by four array of optical processing cell to aid processing for targeting.

(U) FY 1994 Planned Program:

- (U) Demonstrate two-dimensional laser diode arrays as pumping source for solid state lasers.
- (U) Develop two-color IR detectors for improved weather performance of targeting sensors.
- (U) Continue development of UV diode laser, multi-chip-module (MCM) optical interconnects, and long-wave IR detector.
- (U) Demonstrate first organically-based MCM optical interconnects.
- (U) Demonstrate the feasibility of using UV transistors for engine diagnostics.
- (U) Integrate semiconductor lasers and optical circuits with digital electronics.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: AT&T, Holmdel, NJ; Westinghouse Pittsburgh, PA; Lockheed-Sanders Corp., Nashua, NH; Honeywell, Minneapolis, MN; and Hughes, El Segundo and Malibu, CA.

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) Coordinated with DOD Advisory Group on Electron Devices.
- (U) This project has been coordinated through the Project Reliability process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2002, Microwave Technology: Develops and demonstrates technology for microwave (MW) and millimeter wave (MMW) devices, integrated circuits, components, and subsystems, to include solid state and thermionic devices, MW/MMW integrated circuits (MMICs), power and low noise amplifiers, signal controllers, broadband transmit/receive (T/R) modules, and advanced active apertures.

(U) FY 1992 Accomplishments:

- (U) Demonstrated high-efficiency push-pull MMIC amplifiers for use in the 7-11 and 4.5-18 gigahertz (GHz) ranges.
- (U) Developed MMIC amplifiers to operate at over 200° Celsius for high reliability communication, radar, and electronic combat applications.
- (U) Demonstrated 7-11 GHz MMIC filters for radar phased array antennas.
- (U) Demonstrated wideband MMW traveling wave tube for airborne electronic warfare (EW) jammers.

(U) FY 1993 Planned Program:

- (U) Demonstrate ten GHz, 50-100 watt (peak) transistors for airborne radar and EW phased array antennas.
- (U) Develop integrated airborne radar/EW multifunction components (phase shifters, low noise amplifiers).
- (U) Demonstrate microwave vacuum electronic field-emitter amplifier for radar and EW transmitters.

(U) FY 1994 Planned Program:

- (U) Develop power amplifiers with eight watt output power at over 30% efficiency for 7-11 GHz fire control phased array antennas.
- (U) Develop 25 watt linear power amplifier for seven to eight GHz advanced communications transmitters.
- (U) Develop high power, high temperature ten GHz silicon carbide transistors and amplifiers for advanced radar transmitters.
- (U) Develop advanced MMW T/R modules and packaging technology for communications, EW, and radar.
- (U) Demonstrate non-thermionic cathode solid state emitters for radar and EW transmitters.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Hughes Aircraft, El Segundo, CA; TI, Dallas, TX; Raytheon, Lexington, MA; Rockwell International, Thousand Oaks, CA; and TRW, Redondo Beach, CA.

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) PE 0603739E, Microwave/Millimeterwave Integrated Circuits.
- (U) Coordinated with DOD Advisory Group on Electron Devices.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2003, Avionics System Design Technology: Develops and demonstrates avionics display, signal/data processing hardware, sensor integration, real-time distributed software, and artificial intelligence (AI) technology to improve weapon system performance, avionics availability, and crew situational awareness.

(U) FY 1992 Accomplishments:

- (U) Demonstrated adaptive, goal-oriented learning algorithms for adaptive flight controls.
- (U) Implemented common Ada run time system in two compilers.
- (U) Designed architecture for advanced graphics processor and simulator to drive large cockpit displays.
- (U) Demonstrated automatic programming technologies for air-to-air radar tracking algorithms.

(U) FY 1993 Planned Program:

- (U) Demonstrate near-real-time avionics database management.
- (U) Demonstrate reusable Ada software package.
- (U) Demonstrate program execution repeatability with common Ada run time system on different avionics processors.
- (U) Demonstrate reusable avionics software technology.

(U) FY 1994 Planned Program:

- (U) Demonstrate feasibility of a processor trade off tool based on life cycle cost versus performance evaluations of avionics processors.
- (U) Develop techniques of analysis and metrics collection to reduce debug time for distributed avionics processing.
- (U) Develop avionics real-time operation simulation linkages.
- (U) Demonstrate feasibility of using commercial programmable logic arrays for low-cost signal preprocessing.
- (U) Using a knowledge-based approach, develop automatic program generation to reduce test software costs.
- (U) Develop a standard approach to tri-Service avionics database management.
- (U) Design improved Global Positioning System receiver/antenna.
- (U) Demonstrate enhanced pilot situation awareness through advanced cockpit display techniques with graphics processor simulator prior to developing hardware.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Honeywell, Minneapolis, MN; Dimension Technology, Rochester, NY; Harris, Melbourne, FL; Westinghouse, Baltimore, MD; and Lockheed-Sanders, Nashua, NH.

(U) Related Activities:

- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0602301E, Intelligence System Program.
- (U) This project has been coordinated through the Project Reliability process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 2004, Reconnaissance/Strike Electro-Optical Sensors: Develops and demonstrates technologies to improve performance, supportability, and cost of passive and active electro-optical (EO) sensors for reconnaissance, acquisition, and strike to improve target discrimination, increase kill probability, decrease pilot workload, increase survivability, and maintain low probability of detection.

(U) FY 1992 Accomplishments:

- (U) Tested forward-looking infrared (FLIR) focal plane uniformity to quantify automatic target recognizer performance.
- (U) Tested advanced imaging laser radars in varying weather and viewing conditions.

(U) FY 1993 Planned Program:

- (U) Test multispectral FLIRs to determine weather performance.
- (U) Using the variable parameter FLIR, evaluate the performance effects of different scanning techniques with advanced focal plane arrays.

(U) FY 1994 Planned Program:

- (U) Validate dual band FLIR and laser radar models.
- (U) Determine sampling alias correction factor for sample rate experiment using the variable parameter FLIR.
- (U) Incorporate high-value target detection criteria into advanced infrared sensor performance models.
- (U) Improve EO sensor models and data bases to support netted simulations of reconnaissance/offensive strike operations.
- (U) Characterize the effects of sample aliasing on IR imaging and experiment with compensation techniques using the variable parameter FLIR.
- (U) Model both scanning and staring IR sensors for comparison.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Battelle Memorial Institute, Columbus, OH; Environmental Research Institute of Michigan, Ann Arbor, MI; TASC, Reading, MA; Amber Engineering, Goleta, CA; and Electro-Optic Infrared Measurements, Spotsylvania, VA.

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603707F, Weather Systems Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

7. (U) Project 4080, Ballistic Missile Avionics: Develops and demonstrates guidance technologies for ballistic missiles with emphasis on technologies supporting low-cost, common-component guidance sensors with high reliability and simplified maintenance procedures. Also develops electronic devices and integrated circuits (ICs) for radiation-hardened guidance applications.
- (U) FY 1992 Accomplishments:
- (U) Investigated technologies for small, lightweight gyroscope and accelerometers for integrated boost/re-entry guidance.
 - (U) Investigated requirements for tightly integrated Global Positioning System (GPS) inertial guidance package.
- (U) FY 1993 Planned Program: Project Terminated.
- (U) FY 1994 Planned Program: Project Terminated.
- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Sunstrand Data Control Inc., Redmond, WA; Charles Stark Draper Labs, Cambridge, MA; and General Electric, Pittsfield, MA.
- (U) Related Activities:
- (U) PE 0603311F, Ballistic Missile Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
8. (U) Project 6095, Inertial Reference and Guidance Technology: Develop and demonstrates technologies for navigation and guidance sensors and systems and for communication, navigation, identification, and electronic warfare multifunction antennas. Accuracy improvements in aerospace inertial navigation systems and sensors are needed to conduct reconnaissance and precision attack missions.
- (U) FY 1992 Accomplishments:
- (U) Developed solid state accelerometer on-a-chip for low-cost and high reliability precision guidance.
 - (U) Developed multifunction antenna concepts for communication, navigation, identification, and electronic warfare transmission and reception.
- (U) FY 1993 Planned Program:
- (U) Develop techniques for exploiting GPS for improved threat emitter location for electronic combat.
 - (U) Fabricate microstrip antenna and feed network for ultra-high frequency communications and GPS functions.
 - (U) Complete feasibility assessment of an inertial network concept to provide precise munition and sensor reference measurements on flexible composite aircraft.
 - (U) Design low-cost velocity sensor for low level penetration missions.

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PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

(U) FY 1994 Planned Program:

- (U) Design enhanced Global Positioning System (GPS) capabilities for airborne weapon delivery platforms and munitions.
- (U) Develop wideband all-digital antenna array electronics for communication, navigation, identification, and GPS functions.
- (U) Develop and test flexible, hollow-core, contour-mountable fiber optic inertial measurement sensors for weapon and sensor boresight reference correction.
- (U) Demonstrate low-cost velocity sensor breadboard approach for low altitude penetrator missions.
- (U) Design a precision fiber optic gyro for long-range navigation and guidance.
- (U) Design micro-inertial instruments for weapon guidance applications.
- (U) Feasibility test concept of integrated inertial network for maintaining accurate weapon and sensor references on flexible, composite airframes.
- (U) Test the wideband microstrip antenna in an anechoic chamber.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Litton Systems, Hartford, CT; TRW, San Diego, CA; McDonnell Douglas, St. Louis, MO; TASC, Reading, MA; and Sunstrand Data Control, Redmond, WA.

(U) Related Activities:

- (U) PE 0603253F, Advanced Avionics Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 6096, Microelectronics Technology: Develops and demonstrates technologies to maintain a comprehensive integrated circuit (IC) technology base for current and future weapon and support applications. This includes device feasibility and development, device application, design, and associated packaging and power management technology to preserve and utilize device performance in electronic equipment.

(U) FY 1992 Accomplishments:

- (U) Demonstrated a high-performance indium phosphide (InP) transistor in a 20 gigahertz (GHz) multiplexer for communications.
- (U) Demonstrated resonant tunneling transistor logic for one third fewer devices per function and faster operation.
- (U) Demonstrated an advanced four kilobit static random access memory and transferred to pilot line production.

(U) FY 1993 Planned Program:

- (U) Demonstrate software using Very High Speed Integrated Circuits (VHSIC) hardware description language to implement multi-chip package designs.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

- (U) Demonstrate an integrated differential pressure sensor with direct digital output for air data applications.
 - (U) Demonstrate planar silicon carbide monolithic circuits operating at 350° Celsius.
 - (U) Demonstrate a monolithic gallium arsenide (GaAs) field effect transistor (FET) for advanced electronic warfare digital radio frequency memories.
- (U) FY 1994 Planned Program:
- (U) Fabricate multi-chip modules using monolithic GaAs FET for electronic warfare digital radio frequency memories.
 - (U) Integrate advanced design tools into a common software environment to rapidly trade off advanced signal processor designs.
 - (U) Demonstrate combined indium phosphide and gallium antimonide-based transistor gates integrated with memory cells for lower power, higher speed signal processors.
 - (U) Establish baseline processing techniques for high temperature silicon carbide engine controllers.
 - (U) Design linear integrated circuits for communication, guidance, and electronic warfare technologies.
- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Rockwell International, Thousand Oaks, CA; TI, Dallas, TX; Honeywell, Minneapolis, MN; and General Electric, Schenectady, NY.
- (U) Related Activities:
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
 - (U) PE 0602702F, Command, Control, and Communications.
 - (U) Coordinated with DOD Advisory Group on Electron Devices.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
10. (U) Project 7622, Reconnaissance/Strike Radio Frequency Sensors: Develops and demonstrates technologies for reconnaissance and strike mission radio frequency sensors, with emphasis on reliable, all-weather acquisition of surface and airborne targets that have difficult signatures due to reduced cross sections, concealment and camouflage measures, severe clutter, and heavy jamming.
- (U) FY 1992 Accomplishments:
- (U) Investigated techniques to improve ultra-high resolution (UHR) synthetic aperture radar (SAR) jam resistance.
 - (U) Investigated processing three-dimensional SAR images for improved target detection in clutter.
 - (U) Completed test aircraft high resolution bistatic imaging radar equipment configuration for FY 1993 satellite and FY 1994 shuttle experiments.
- (U) FY 1993 Planned Program:
- (U) Develop electronic counter-countermeasure algorithms to reduce UHR SAR electronic countermeasure susceptibility.

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PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

- (U) Perform bistatic synthetic aperture radar target imaging receiver experiments with satellites.
- (U) Investigate two-dimensional radar target imaging for airborne non-cooperative target identification.
- (U) Develop adaptive techniques/architectures to cancel jamming of radars and affordable, low-cost architectures for radar.

(U) FY 1994 Planned Program:

- (U) Design lightweight sensors for high speed terminal homing applications.
- (U) Investigate improvements in targeting performance with application of motion compensation and autofocus techniques to strike aircraft radar.
- (U) Develop specific electronic counter-countermeasure (ECCM) techniques for air-to-surface synthetic aperture radar (SAR).
- (U) Investigate two-dimensional radar target imaging for airborne non-cooperative target identification.
- (U) Develop advanced adaptive radar techniques for multi-channel cancellation of jammers.
- (U) Continue bistatic SAR target imaging experiments with satellites.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: ERIM, Ann Arbor, MI; Westinghouse, Linthicum, MD; Norden, Norwalk, CT; Ohio State University, Columbus, OH; JPL, Pasadena, CA; and TSC, Santa Monica, CA.

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) Coordinated through the Joint Directors of Laboratories Sensor Panel.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

11. (U) Project 7629, Fire Control Avionics: Develops and demonstrates fire control concepts and technologies that aid in precisely locating, identifying, and targeting airborne and surface targets, with emphasis on reduced signature targets and opportunity targets, to enable new covert tactics for successful accomplishment of air-to-air and air-to-surface strike scenarios.

(U) FY 1992 Accomplishments:

- (U) Completed preliminary design of advanced detection and tracking algorithms for tactical airborne radar.
- (U) Investigated multi-sensor fusion algorithms for targeting.

(U) FY 1993 Planned Program:

- (U) Test real-time advanced detection/tracking algorithms on next generation processor using radar flight test data.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

- (U) Flight test forward infrared air-to-surface target cueing technology.
- (U) Evaluate interactive air-to-air attack simulation.
- (U) FY 1994 Planned Program:
 - (U) Complete basic air-to-air modeling effort and determine requirements for real-time/man-in-the-loop demonstrations.
 - (U) Complete real-time testing of advanced detection and tracking algorithms on next generation processor hardware.
 - (U) Develop advanced model-based fusion techniques for target recognition.
 - (U) Demonstrate feature-level fusion concepts for longer-range, all-aspect target identification.
 - (U) Define airborne mission management to support replanning after off-board cueing.
- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: New York University, New York, NY; Honeywell, Minneapolis, MN; McDonnell Douglas, St. Louis, MO; Westinghouse, Baltimore, MD; and Veda, Dayton, OH.
- (U) Related Activities:
 - (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
 - (U) Tri-Service coordination is accomplished through the Joint Services Guidance and Control Committee.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 12. (U) Project 7633, Passive Electronic Countermeasures: Develops and demonstrates passive electronic countermeasure (ECM) technologies and techniques to provide for improved threat warning, reduced detectability, improved expendables, and to exploit foreign systems to reveal countermeasures vulnerabilities. These technologies must be continually evolved to counter changing threats to ensure aircraft survivability.
 - (U) FY 1992 Accomplishments:
 - (U) Demonstrated fiber optic-based laser warning receiver.
 - (U) Patented in-house invention needed for wideband digital electronic warfare (EW) receiver development.
 - (U) Characterized laser warning receiver in laboratory test.
 - (U) Demonstrated neural network processing of emitter pulse data with processing time reduced by factor of one hundred.
 - (U) FY 1993 Planned Program:
 - (U) Demonstrate wide bandwidth compressive (microscan) receiver for high intercept probability in dense pulse environment.
 - (U) Develop low-cost optical filtering techniques for infrared (IR) missile warning focal plane arrays.
 - (U) Develop an algorithm that only needs pulse-time-of-arrival to determine angle of arrival.
 - (U) Demonstrate real-time, high speed processing to improve infrared missile warning.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

- (U) FY 1994 Planned Program:
 - (U) Demonstrate one gigahertz (GHz) all-digital electronic warfare (EW) receiver breadboard based on a sub-Nyquist sampling technique.
 - (U) Demonstrate laser detection warning technique against continuous wave (non-pulsed) sources which cannot be detected using standard pulse discrimination detection.
 - (U) Demonstrate emitter location technique adaptable to EW receivers for enhanced pilot situation awareness.
 - (U) Demonstrate single-antenna emitter angle tracking algorithm for countering electronic jamming.
 - (U) Demonstrate techniques to decode time-coincident pulses in an instantaneous frequency measurement receiver.
 - (U) Upgrade simulation for real-time internetted operation to evaluate threat avoidance.
- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Systems Research Laboratory, Dayton, OH; Loral, Yonkers, NY; Eaton AIL, Deer Park, NY; Honeywell, Minneapolis, MN; and Tracor Aerospace, Austin, TX.
- (U) Related Activities:
 - (U) PE 0603270F, Electronic Combat Technology.
 - (U) Joint Director of Laboratories, Technology Program for Electronic Warfare, Tri-Service Coordinating Body.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 13. (U) Project 7662, Avionics Data Transmission and Reception: Develops and demonstrates technologies to provide for the growing need to transmit data between aircraft with high integrity, low probability of detection (LPD), and high jam resistance (JR). LPD communications are required to reduce aircraft physical and electromagnetic vulnerability and eliminate requirement for 'no communications' operations providing major improvements in strike effectiveness.
 - (U) FY 1992 Accomplishments:
 - (U) Demonstrated adaptive LPD communications technology.
 - (U) Demonstrated multibeam, multi-user optical communications technology.
 - (U) Completed design of a tactical airborne multibeam omni-directional low probability of intercept laser communications breadboard.
 - (U) FY 1993 Planned Program:
 - (U) Fabricate tactical airborne multibeam omni-directional laser communications breadboard for short-range air-to-air covert communications.
 - (U) Evaluate adaptive communication featureless waveform for intercept receiver.
 - (U) Conduct an airborne demonstration of a very compact, hand-held, short-range laser radio.

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Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: #1 - Technology Base

- (U) Determine feasibility of using deformable mirror devices in communication applications.
- (U) Evaluate the utility of ultraviolet communications during nap of the earth operations.
- (U) FY 1994 Planned Program:
 - (U) Complete omni-directional laser breadboard fabrication and integrate with optical antenna.
 - (U) Design expert communications link manager program to develop reduced cockpit-workload communication.
 - (U) Investigate noise cancellation techniques for airborne communications.
 - (U) Simulate deformable mirror designs for non-gimbaled beam forming/steering communication applications.
 - (U) Define communication link requirements to support real-time strike aircraft with off-board precision targeting information.
- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Georgia Technical Research Institute, Atlanta, GA; TRW, Dayton, OH; Martin Marietta, Denver, CO; and University of Dayton Research Institute, Dayton, OH.
- (U) Related Activities:
 - (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
 - (U) PE 0603253F, Advanced Avionics Integration.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602205F
PE Title: Personnel, Training, and Simulation

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06HT Armstrong Laboratory Support	12,668	12,729	10,964	Cont	TBD
1121 Training Development and Assessment Technology	2,721	3,441	3,591	Cont	TBD
1123 Aircrew Training Technology	6,900	7,852	7,555	Cont	TBD
1710 Logistics and Maintenance Technology	3,125	4,119	4,042	Cont	TBD
7719 Force Acquisition and Distribution Technology	2,837	3,067	2,790	Cont	TBD
Total	28,251	31,208	28,942	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops technologies to increase operational readiness by: providing more effective methods to classify, assign, train, and retain personnel; minimizing the manpower and equipment necessary to conduct maintenance; increasing weapon systems supportability; and improving wartime logistics planning. The program focuses on reducing the manpower required to operate and support weapon systems and on improving the effectiveness of the operators and maintainers.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- (U) Project 06HT, Armstrong Laboratory Support: This project provides for the management, support, and operation of the Human Resources Directorate of the Armstrong Laboratory. The Directorate is located at Brooks AFB, TX, Wright-Patterson AFB, OH, and Williams AFB, AZ. It provides for pay and related costs of civilian personnel; equipment transportation; rents; communications and utilities costs; reproduction; and supplies, equipment, and contractor support services. Funds support and complement all projects in this PE.
- (U) Project 1121, Training Development and Assessment Technology: This project develops technology to accelerate learning and increase skill/knowledge retention, job performance, and cost-effective methods for designing, delivering, and evaluating training. Increased use of advanced technology and changes in the overall qualifications of the recruit pool add challenge to the already demanding task of training Air Force recruits.

(U) FY 1992 Accomplishments:

- (U) Developed improved procedures to apply in defining job skill requirements -- permits more accurate assessment of training needs and methods.
- (U) Applied hypermedia technologies to computer-based training authoring systems for improved instructional design tools.
- (U) Developed experimental computer-based models to assess and improve the effectiveness and efficiency of training programs.

(U) FY 1993 Planned Program:

- (U) Integrate training, planning, and evaluation technologies into automated instructional design support tools,

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Program Element: #0602205F
PE Title: Personnel, Training, and Simulation

Budget Activity: #1 - Technology Base

- incorporating knowledge from expert instructional developers to guide the actual training developer.
- (U) Apply advanced human-machine interface technologies to intelligent tutoring systems.
- (U) Develop and field test instructional methodologies for a desktop logistics command and control trainer.
- (U) Develop training evaluation models to quantify loss of skills with time after training, and gain in training for one skill after training for a similar skill.
- (U) FY 1994 Planned Program:
 - (U) Evaluate a technology for automated design of instruction for novice designers to develop quality training.
 - (U) Apply advanced human-machine interface technologies to intelligent tutoring systems.
 - (U) Demonstrate a virtual environment interface that can be used to author an intelligent tutor.
 - (U) Develop and assess the interface for desktop logistics command and control trainers.
- (U) Work Performed By: Work is performed and managed by the Armstrong Laboratory, Brooks AFB, TX. The top contractors are: FMC Corp., Santa Clara, CA; MEI Technology, Lexington, MA; Harris Corp., Melbourne, FL; Universal Energy Systems, Dayton, OH; and McDonnell Douglas Corp., St. Louis, MO.
- (U) Related Activities:
 - (U) PE 0603227F, Personnel, Training, and Simulation Technology.
 - (U) PE 0604243F, Manpower, Personnel, and Training Development.
 - (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
 - (U) PE 0602785A, Manpower, Personnel, and Training Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 1123, Aircrew Training Technology: This project develops and evaluates new methods and techniques for aircrew training. It investigates the spectrum of aircrew training for the best ways to design, deliver, and assess training on the ground and in the air. It develops and evaluates flight simulation technologies from desktop trainers to full mission simulators to determine the minimum fidelity to achieve maximum training benefits. This project will reduce the cost of future aircrew training systems and increase the capability for realistic combat training.
 - (U) FY 1992 Accomplishments:
 - (U) Developed a method for evaluating cargo aircraft training technology.
 - (U) Optimized color control across computer-generated image displays for better fidelity and lower cost simulation technology.
 - (U) Determined object density requirements for low altitude flight simulation imagery.
 - (U) Established night vision device training technology.
 - (U) Determined frequency and severity of simulator sickness associated with dome and rear screen projection displays for fighter aircraft applications.

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Program Element: #0602205F
PE Title: Personnel, Training, and Simulation

Budget Activity: #1 - Technology Base

(U) FY 1993 Planned Program:

- (U) Develop low-cost personal computer-based, head-mounted visual debriefing technology for air intercept part-task training.
- (U) Develop a generic video to interactively train aircrews in the use of integrated forward-looking infrared/radar night vision goggles.
- (U) Determine ability of simulator displays to teach distance estimation when using night vision goggles.
- (U) Develop metrics to assess aircrew situational awareness in simulated multiship tactical engagements.
- (U) Assess low-cost visual display technology to replace current tactical simulation displays.

(U) FY 1994 Planned Program:

- (U) Develop multiship mission planning/rehearsal procedures for weapon systems using ground-based simulation.
- (U) Evaluate low-cost rear screen projection visual display technology to recommend a standard for simulators for tactical mission training.
- (U) Determine visual scene content requirements to support tactical mission simulator training.
- (U) Determine ability of low-cost simulations such as virtual reality to support aircrew training.
- (U) Establish guidelines for the design of a night vision goggle visual simulation database.

(U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Williams AFB, AZ. The top contractors are: University of Dayton, Dayton, OH; and General Electric Corp., Daytona Beach, FL.

(U) Related Activities:

- (U) PE 0603227F, Personnel, Training, and Simulation Technology.
- (U) PE 0604227F, Flight Simulator Development.
- (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
- (U) PE 0602727A, Non-System Training Devices Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 1710, Logistics and Maintenance Technology: This project develops: new technologies to improve logistics support to both combat and peacetime operations; improved planning and assessment models for realistic computation of wartime logistics requirements and capabilities; trade off methods to reduce the manpower and equipment necessary to maintain aircraft in a dispersed location; and software tools to design improved reliability, maintainability, supportability, and man-machine interfaces to reduce life cycle costs. Conventional maintenance methods, practices, and procedures must be modernized to adequately support future complex weapon systems.

(U) FY 1992 Accomplishments:

- (U) Developed a database to estimate time required to do selected maintenance tasks for use in minimizing manpower,

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Program Element: #0602205F
PE Title: Personnel, Training, and Simulation

Budget Activity: #1 - Technology Base

- personnel, and training costs during the design phase of weapon systems.
- (U) Developed an object-oriented database for logistics simulation to improve information storage, retrieval, update, and display.
- (U) Developed human performance process models that replicate human behavior.
- (U) FY 1993 Planned Program:
 - (U) Develop logistics simulation models to perform logistics trade offs at all component levels.
 - (U) Develop a computer test-bed to determine, early in the design phase of a life cycle cost-controlled project, how well humans interact with new equipment.
 - (U) Model and compare alternative processes among equipment and humans when information flows are intense and reaction time is critical -- as in aircraft repair during combat conditions.
- (U) FY 1994 Planned Program:
 - (U) Evaluate and test next generation logistics simulation software.
 - (U) Develop preliminary tools for information system design for logistics offices.
- (U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Wright-Patterson AFB, OH. The top contractors are: CSERIAC, University of Dayton, Dayton, OH; BBN, Cambridge, MA; NCI Information Systems, McLean, VA; and Atlantic Research Corp., Fairborn, OH.
- (U) Related Activities:
 - (U) PE 0603106F, Logistics Systems Technology.
 - (U) PE 0602716A, Human Factors Engineering Technology Development.
 - (U) PE 0602234N, Mission Support Technology: Human Factors Technology Area.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 5. (U) Project 7719, Force Acquisition and Distribution Technology: This project develops personnel qualification and aptitude measurement methods, job specification standards, and manpower and personnel models to provide methods and tools for optimal selection, classification, and assignment of personnel.
 - (U) FY 1992 Accomplishments:
 - (U) Developed a model of the personnel specialty structuring system that assists possible trade offs between various task level skills.
 - (U) Delivered guidelines for optimizing decisions on personnel retraining decisions.
 - (U) Completed processing and classification of person-job-match system for improved classification of trainees.
 - (U) Completed computer-based personnel testing technology for improved pilot selection.

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Program Element: #0602205F
PE Title: Personnel, Training, and
Simulation

Budget Activity: #1 - Technology Base

(U) FY 1993 Planned Program:

- (U) Deliver assignment-level person-job-match capability for Air Force assignment system integration.
- (U) Deliver initial neural network models for enhancing enlisted and officer force management.
- (U) Complete guidelines for implementation of cognitive task analysis technology in developing trouble-shooting tutors.
- (U) Complete evaluation of technology for a situational awareness test battery to improve pilot selection.

(U) FY 1994 Planned Program:

- (U) Evaluate preliminary aptitude standards model to improve allocation of people to their best suited jobs.
- (U) Develop combat operations person-job-match technology.
- (U) Develop computer-administered personality test for pilot selection.
- (U) Identify and explore factors showing leadership potential for commanders of Air Force medical units.

(U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Brooks AFB, TX. The three contractors are: Metrica Inc., Bryan, TX; Computer Data Systems Inc., San Antonio, TX; and Systems Research and Applications Corp., San Antonio, TX.

(U) Related Activities:

- (U) PE 0603227F, Personnel, Training, and Simulation Technology.
- (U) PE 0604243F, Manpower, Personnel, and Training Development.
- (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
- (U) PE 0602785A, Manpower, Personnel, and Training Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602206F

Budget Activity: #1 - Technology Base

PE Title: Civil Engineering and Environmental Quality

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06ED Laboratory Operations	0	0	2,177	Cont	TBD
1900 Environmental Quality Technology	3,302	6,943	2,494	Cont	TBD
2673 Air Base Operability Technology	<u>3,766</u>	<u>4,333</u>	<u>2,516</u>	<u>Cont</u>	<u>TBD</u>
Total	7,068	11,276	7,187	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology exploratory development program develops civil engineering and environmental technology for deploying, operating, and maintaining Air Force weapon systems. These technologies support the following areas: protective construction of air base facilities, utilities, and operating surfaces against conventional and chemical/biological attacks; air mobile structures; rapid air base battle damage assessment and repair; cost-effective maintenance and repair of air base facilities, utilities, and operating surfaces; peacetime and post-attack air base and aircraft fire suppression and crash rescue; control, detection, and disposal of pollutants from Air Force operations; reduction of hazardous waste generation at air bases; and methods for cleaning up contaminated Air Force sites. The Civil Engineering Laboratory was realigned from the Air Force Civil Engineering Support Agency to Air Force Materiel Command in FY 1993. Project 06ED has been added to support the laboratory operations, which had previously been funded from Operations and Maintenance accounts.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 06ED, Laboratory Operations: This project will support and complement all other projects in this program element and provides for management, support, and operation of the Armstrong and Wright Laboratories located at Tyndall AFB, FL. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; travel; transportation of equipment; rents; communications; utilities; laboratory supplies; unique equipment; and related costs needed to conduct environmental quality and air base operability exploratory development.
- (U) Project 1900, Environmental Quality Technology: This project characterizes the chemistry of Air Force generated pollutants and toxic materials, assesses their interaction with the environment, and develops control and clean-up technologies. Technologies are developed to reduce the cost and increase the effectiveness of protecting the environment. New Air Force fuels and chemicals, such as jet engine and rocket fuels, are monitored to anticipate and prevent environmental problems from occurring and to prevent delays in testing and fielding weapon systems. Materials are investigated and new processes explored to minimize hazardous waste generation. Site remediation technologies are also explored.

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Program Element: #0602206F

Budget Activity: #1 - Technology Base

PE Title: Civil Engineering and
Environmental Quality

(U) FY 1992 Accomplishments:

- (U) Investigated atmospheric impacts of volatile organic compound emissions from paint spray booths resulting from recirculating the exhaust; reduced the volume of contaminated air requiring treatment by a factor of ten.
- (U) Developed cryogenic removal technology to extract solid rocket propellant for disposal; reduces hazardous waste.
- (U) Developed aircraft paint stripping technology using biodegradable material.

(U) FY 1993 Planned Program:

- (U) Develop environmentally safe techniques to biodegrade decommissioned solid rocket propellant.
- (U) Develop biological mechanisms for the biodegradation of explosive compounds.
- (U) Develop fiber optic monitoring technologies for contamination identification at hazardous or inaccessible sites.

(U) FY 1994 Planned Program:

- (U) Investigate atmospheric chemistry of Air Force industrial solvents currently in use to predict risks of air releases for new materials.
- (U) Develop and identify control technologies to reduce air toxic emissions from Air Force industrial operations.
- (U) Develop environmentally-safe disposal technology for energetic material waste.

(U) Work Performed By: Armstrong Laboratory, Tyndall AFB, FL, manages this project. Contractors are: EG&G, Idaho Falls, ID; Martin Marietta, Oak Ridge, TN; ASI, Albuquerque, NM; General Atomics, San Diego, CA; and Lockheed Missiles and Space, Palo Alto, CA.

(U) Related Activities:

- (U) PE 0601102F, Defense Research Sciences.
- (U) PE 0602102F, Materials.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603723F, Civil and Environmental Engineering Technology.
- (U) This program adheres to Tri-Service Reliance Agreements on Environmental Quality with oversight and coordination provided by the Joint Engineers.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2673, Air Base Operability Technology: This project provides the technology base for current and future Air Force systems in these areas: survivable air base structures, utilities, and operating surfaces against more accurate and powerful conventional and chemical/biological weapons; battle damage assessment and repair; air mobile structures; and cost-effective maintenance and repair of air base facilities, utilities, and operating surfaces.

(U) FY 1992 Accomplishments:

- (U) Demonstrated that a high velocity projectile can be consistently defeated in flight by reactive armor defense technology for hardened structures.

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Program Element: #0602206F
PE Title: Civil Engineering and
Environmental Quality

Budget Activity: #1 - Technology Base

- (U) Defined fire risks and protection requirements for new aircraft entering the inventory.
- (U) Defined sensor technology needed for automated airfield damage assessment.
- (U) FY 1993 Planned Program:
 - (U) Develop a concept for a solar energy conversion technology on Air Force facilities.
 - (U) Define the mechanism of pavement damage from vectored jet thrust.
 - (U) Develop next generation firefighting ensemble designed to protect against hazardous materials and high temperatures.
 - (U) Develop modular energy-absorbing construction material for deployable protective shelters.
- (U) FY 1994 Planned Program:
 - (U) Develop materials for advanced methods of runway crater repair.
 - (U) Develop a concept for superconductive energy storage for bare base deployment.
 - (U) Develop next generation mobile electric power concepts.
 - (U) Study special fire protection considerations and applications to ground operations supporting Air Force missile launch and preparation facilities.
 - (U) Develop advanced multispectral camouflage, concealment, detection for airbase facilities.
- (U) Work Performed By: Wright Laboratory, Tyndall AFB, FL, manages this project. Contractors are: New Mexico Engineering Research Institute, Albuquerque, NM; Applied Research Associates, Albuquerque, NM; EML Research, Hudson, NH; Research Associates of Syracuse, Syracuse, NY; and Harris Group, Reston, VA.
- (U) Related Activities:
 - (U) PE 0601102F, Defense Research Sciences.
 - (U) PE 0602102F, Materials.
 - (U) PE 0602202F, Human Systems Technology.
 - (U) PE 0602203F, Aerospace Propulsion.
 - (U) PE 0603211F, Aerospace Structures.
 - (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
 - (U) PE 0603307F, Air Base Operability Advanced Development.
 - (U) PE 0603723F, Civil and Environmental Engineering Technology.
 - (U) This program adheres to Tri-Service Reliance Agreements on Environmental Quality with oversight and coordination provided by the Joint Engineers.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E SUMMARY SHEET

Program Element: #0602302F
PE Title: Rocket Propulsion and
Astronautics Technology

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
06RL Laboratory Operations	18,213	21,734	14,019	Cont	TBD
2864 Space Vehicles Technology	8,547	3,589	5,554	Cont	TBD
3058 Space Systems Propulsion Technology	6,945	3,150	11,039	Cont	TBD
3059 Missile Systems Propulsion Technology	<u>2,896</u>	<u>7,539</u>	<u>9,419</u>	<u>Cont</u>	<u>TBD</u>
Total	36,601	36,012	40,031	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology (S&T) program element (PE) develops rocket propulsion and space vehicle technology. This program conducts exploratory development to transition the most promising technologies into component and subsystem applications to demonstrate feasibility and potential payoffs. Technologies of interest are those which will improve reliability, operability, survivability, affordability, environmental compatibility, and performance of future propulsion systems. Technologies which are demonstrated to have significant payoff in this program are transitioned to Space and Missile Rocket Propulsion (PE 0603302F) or Advanced Spacecraft Technology (PE 0603401F) where they are further developed for transition to specific space or missile systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- (U) Project 06RL, Laboratory Operations: Project 06RL provides for the management, support, and operation of the Phillips Laboratory. It maintains test and experiment infrastructure and facilities used for key in-house efforts; provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. Funds from this continuing project support and complement the other projects in this PE.
- (U) Project 2864, Space Vehicles Technology: This project develops advanced technologies for spacecraft structures and control, power and thermal management, space materials application, and space vehicle operations technologies. These technologies increase performance, enhance survivability, improve reliability, improve operational flexibility, and reduce weight and life cycle costs of Air Force space vehicle systems. These technologies will also improve U.S. competitiveness in the international space launch marketplace.

(U) FY 1992 Accomplishments:

- (U) Conducted system-level tests of space structures to verify active vibration control techniques for large space structures such as surveillance sensor platforms.
- (U) Demonstrated a lightweight composite payload shroud, allowing major payload increases.

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Program Element: #0602302F
PE Title: Rocket Propulsion and
Astronautics Technology

Budget Activity: #1 - Technology Base

- (U) Investigated long-life cryogenic cooler design options required to meet long wave infrared sensor cooling needs.
- (U) Evaluated solid state polymers power devices which allow a three times energy density increase.
- (U) Identified and evaluated thin-film solar cells for lightweight, advanced solar power arrays.

(U) FY 1993 Planned Program:

- (U) Demonstrate piezo-ceramic sensors and actuator embedability into advanced materials, showing an increase in spacecraft structural damping greater than two orders of magnitude.
- (U) Develop composite spacecraft joining technologies, reducing weight by 50 percent over metallic joints.
- (U) Evaluate composite material capability to reduce weight and improve heat dissipation in advanced spacecraft electronics packaging and cooling.
- (U) Design a carbon-carbon heat pipe radiator to reduce spacecraft cooling radiator weight by 30 percent.
- (U) Develop radiation tolerant, high efficiency thin-film solar cells to incorporate into advanced spacecraft power arrays.
- (U) Begin solid state polymer battery cell evaluations.

(U) FY 1994 Planned Program:

- (U) Complete the advanced vibration control demonstration allowing two orders of magnitude increase in control system robustness and adaptability.
- (U) Begin adaptive, autonomous vibration and shape control neural network technology application to space structures.
- (U) Demonstrate an automatic vibration sensing and correcting modular control for space structures, reducing control system weight and volume by a factor of ten.
- (U) Exploit residual hardware, experimentally demonstrating a 100 times reduction in line-of-sight vibrations for precision spaceborne optical systems.
- (U) Conduct thin-film, advanced gallium arsenide solar cell performance characterization and failure analysis.
- (U) Investigate carbon-carbon and other composite materials for satellite solar array applications, allowing a 40 percent reduction in power array weight.
- (U) Evaluate system efficiency, space radiation degradation, and solar effluence of advanced thin-film and multi-band gap solar cells.
- (U) Continue advanced solid state polymer battery evaluation.
- (U) Evaluate Hydrogen Thermoelectric Converter for spacecraft application suitability.
- (U) Evaluate potassium charged heat pipes for very high temperature heat rejection.

(U) Work Performed By: This project is managed by the Phillips Laboratory Space and Missiles Directorate, Kirtland AFB, NM. The major contractors are: Harris Corporation, Melbourne, FL; McDonnell Douglas Space Systems, Huntington Beach, CA; Boeing Aerospace, Seattle, WA; Martin Marietta Astronautics, Denver, CO; and TRW Missiles Systems, Redondo Beach, CA.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602203F, Aerospace Propulsion and Power Technologies.
- (U) PE 0603401F, Advanced Spacecraft Technology.

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Program Element: #0602302F
PE Title: Rocket Propulsion and
Astronautics Technology

Budget Activity: #1 - Technology Base

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
3. (U) Project 3058, Space Systems Propulsion Technology: This project develops and demonstrates advanced space systems rocket propulsion technology to meet the projected Air Force requirements. In the past, accomplishments of this project have contributed to national space launch capability including Space Shuttle, Titan, Atlas, and Delta. Technologies to be investigated under this project include revolutionary new approaches to develop a "simple" cryogenic turbopump with hydrostatic bearings to enable engine reusability. High performance thrust cell technology is being investigated for modular, reusable liquid engines. This program also investigates and develops technologies for solar, electric, and high energy density materials (HEDM) propulsion systems; concepts which will dramatically increase the capability of future space propulsion systems. Anticipated technology advances in this project will increase the reusability of liquid propulsion engines from three flights to over 50 flights, increase the payload capability of existing expendable launch systems seven percent, reduce the number of parts for cryogenic turbopumps by 80 percent, and integrate high energy density material propellants into future space propulsion systems increasing the delivered specific impulse of propellants by 50 percent which will result in a ten-fold increase in vehicle payload capability. Rocket propulsion technologies being investigated in this project will enhance continuous improvement to current and future space lift and on-orbit transfer vehicles by including considerations for reusable liquid engines and improved operability of existing liquid engines. The long-term investment strategy of this project is to develop advanced propulsion system technologies which will revolutionize national space transportation opportunities by dramatically reducing development, operational, and launch costs of future space transportation systems. These investments will also allow the domestic propulsion and spacecraft industries to transition improved capability for competitive commercial space transportation systems.
- (U) FY 1992 Accomplishments:
- (U) Developed and fabricated a subscale inflatable solar concentrator required for high performance solar/thermal propulsion concepts.
 - (U) Conducted hot firings of high energy density propellant candidates in subscale thrusters to demonstrate significant increase in rocket motor performance.
- (U) FY 1993 Planned Program:
- (U) Conduct preliminary feasibility testing of lightweight, composite turbopump components for space launch systems.
 - (U) Design and fabricate a microthruster apparatus to evaluate high energy density material additives to rocket fuel which will provide a significant increase in motor performance.
- (U) FY 1994 Planned Program:
- (U) Initiate feasibility demonstration of a ten-fold increase in combustion chamber durability for space launch propulsion.

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Program Element: #0602302F
PE Title: Rocket Propulsion and
Astronautics Technology

Budget Activity: #1 - Technology Base

- (U) Develop capability to predict and mitigate liquid rocket combustion instability in space launch systems.
 - (U) Demonstrate the feasibility of altitude compensation nozzle technology which can increase payload capability of current expendable space transportation systems by seven percent.
 - (U) Develop a solar thruster to demonstrate the feasibility of the technology for orbit transfer vehicle applications.
 - (U) Begin small-scale synthesis of promising high energy density materials compounds to acquire quantities sufficient for feasibility demonstrations in small-scale test motors.
 - (U) Begin ultra-high temperature turbine testing for advanced space propulsion concepts.
 - (U) Fabricate and evaluate high temperature engine materials and coatings.
 - (U) Initiate advanced space propulsion baseline engine design for Air Force mission applications.
- (U) Work Performed By: This project is managed by the Phillips Laboratory Propulsion and Space and Missile Technologies Directorates at Edwards AFB, CA, and Kirtland AFB, NM. The major contractors are: Aerojet Propulsion, Sacramento, CA; Hercules Aerospace Company, Manga, UT; General Dynamics Space Systems, San Diego, CA; Rockwell Rocketdyne, Canoga Park, CA; and United Technologies/Pratt & Whitney, West Palm Beach, FL.
- (U) Related Activities:
- (U) PE 0603302F, Space and Missile Rocket Propulsion.
 - (U) PE 0603401F, Advanced Spacecraft Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
4. (U) Project 3059, Missile Systems Propulsion Technology: This project develops and demonstrates advanced solid rocket propulsion technology for future space boosters and missile systems including tactical weapon systems. The long-term strategy of this project is to dramatically impact the operability, survivability, affordability, environmental compatibility, and maintainability of Air Force missile propulsion systems. Technologies to be investigated under this project include: environmentally acceptable new propellants and unique processes to reclaim propellant ingredients; environmentally safe motor manufacture procedures; reduced solid propulsion system development and fabrication costs through simplified designs and reduced processing steps; low signature technologies to improve overall weapon systems survivability; and improved bonding systems to increase service life. Anticipated technology advances will reduce the environmental hazards of the fabrication, operation, and demilitarization of solid rocket motors by 80 percent. Technology under development will reduce the cost and time to fabricate a solid propulsion system by 50 percent. The products of this project provide the technology to minimize the risk for potential missile propulsion system upgrades and modifications as well as any planned new developments. This project will also transition technologies to industry, developing internationally competitive commercial solid boosters. Past accomplishments of this project

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Budget Activity: #1 - Technology Base

have been the basis for tactical, strategic, and space launch rocket propulsion systems (e.g., graphite motor cases, carbon-carbon nozzle materials, smokeless propellants). In addition, work performed here maintains skill levels and knowledge needed to support DoD when problems are encountered with developing and/or fielding current or future weapon systems.

(U) FY 1992 Accomplishments:

- (U) Identified and characterized environmentally acceptable propellants for space boosters and ballistic missiles.

(U) FY 1993 Planned Program:

- (U) Complete investigation leading to military reuse of ammonium perchlorate, reducing hazardous waste disposal.
- (U) Analyze and test five new polymers for use in lightweight ballistic missile components.
- (U) Complete effort on clean propellants (<1% hydrochloric acid in the exhaust) for advanced boosters.
- (U) Complete the feasibility investigation of an innovative processing technology which reduces the rocket motor processing steps from 23 to 9.
- (U) Initiate studies to identify rocket approaches to tactical weapon rocket exhaust plume reductions.

(U) FY 1994 Planned Program:

- (U) Begin the development of improved ballistic missile service life extension technologies to more accurately define operability requirements.
- (U) Demonstrate an environmentally acceptable propellant and motor fabrication process that will decrease the environmental hazards of solid propellant exhaust and solid propellant motor manufacturing procedures by 80 percent.
- (U) Identify candidate tactical missile signature reduction approaches and initiate development of low signature rocket motor technologies for tactical weapon application.
- (U) Initiate studies to identify environmentally compatible manufacturing procedures for tactical rocket motors.

(U) Work Performed By: This program is managed by the Phillips Laboratory Propulsion Directorate located at Edwards AFB, CA. The major contractors are: Aerojet Propulsion, Sacramento, CA; Atlantic Research, Gainesville, VA; Hercules Aerospace, Salt Lake City, UT; Thiokol, Brigham City, UT; and United Technologies/Chemical Systems, San Jose, CA.

(U) Related Activities:

- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare.
- (U) PE 0602303A, Missile Technology.
- (U) PE 0603302F, Space and Missile Rocket Propulsion.
- (U) PE 0603311F, Ballistic Missile Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601F
PE Title: Advanced Weapons

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06WL Laboratory Operations	23,507	28,435	25,550	Cont	TBD
2218 Directed Energy Weapon Technology Assessment	1,854	1,501	850	Cont	TBD
3326 Lasers and Imaging	25,066*	9,838**	2,800	Cont	TBD
5797 High Power Technologies	6,066	5,216	2,800	Cont	TBD
8809 Space Systems Survivability and Hardness Technology	975	1,337	961	Cont	TBD
Total	57,468	46,327	32,961	Cont	TBD

* This includes a \$19M Congressional add for Maui supercomputer purchase.

** This includes a \$5M Congressional add for Maui supercomputer.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This effort advances the state-of-the-art in directed energy weapon (DEW) technologies such as high energy lasers (HELs), high power microwave (HPM) devices, accelerated plasmas, and the associated phenomenologies and effects. This program element (PE) pursues advanced optical technologies including active and passive techniques for high resolution space object imaging and nonlinear optic (NLO) devices. Radiation hardening technologies applicable to Air Force space and missile systems are also developed in this PE. Management and support of the main Phillips Laboratory (PL) at Kirtland AFB, NM, is also included.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06WL, Laboratory Operations: This project provides for the management, support, and operation of the PL, Kirtland AFB, NM, which includes the Lasers and Imaging, Advanced Weapons and Survivability, Space and Missiles, and Space Experiments Technical Directorates. It maintains laboratory infrastructure and facilities used in key in-house efforts; and provides for equipment transportation; rents, communications, and utilities costs; reproduction services; supplies and equipment procurement; contractor support services for maintenance and modification of facilities; and the pay and associated costs of civilian scientists, engineers, and support personnel. This project supports the other projects in this PE and the other PL, Kirtland AFB, NM, 6.3 PEs.
2. (U) Project 2218, Directed Energy Weapon (DEW) Technology Assessment: This project provides vulnerability assessments of representative U.S. strategic and tactical systems to DEWs, DEW technology assessment for specific Air Force missions, and DEW lethality assessments against foreign targets. Models to resolve technical issues related to DEW hardware, propagation phenomena, and target response are developed and validated. This project also conducts laser vulnerability experiments on critical components and subsystems. The results of the DEW vulnerability experiments will be used to update the data base that supports related system vulnerability assessments.

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Budget Activity: #1 - Technology Base

(U) FY 1992 Accomplishments:

- (U) Upgraded and integrated atmospheric compensation, fire control, and damage assessment models into satellite lethality models to realistically evaluate ground-based laser anti-satellite technology options.
- (U) Evaluated low to high power laser technologies for weapon applications.
- (U) Consolidated and updated vulnerability and effects data base for advanced tactical missiles.
- (U) Integrated field data into advanced technology assessment models for optical imaging.
- (U) Assessed feasibility of high power microwave (HPM) technologies for selected tactical applications.

(U) FY 1993 Planned Program:

- (U) Develop models to predict the response of potential tactical heat seeking missile threats to various HPM technologies.
- (U) Evaluate, through experiment, modeling, and analysis, the vulnerability of critical subsystems in potential advanced tactical missile threats to Air Force systems.
- (U) Complete HPM vulnerability assessment of tactical systems using actual effects test data.
- (U) Consolidate existing laser vulnerability data base for potential third world threats, especially for theater missile defense.
- (U) Update Air Force directed energy weapon (DEW) propagation codes by improving modeling including the propagation of a high energy laser beam through a large section of the atmosphere.

(U) FY 1994 Planned Program:

- (U) Begin developing a computer model to study trade offs in HPM systems power, weight, and performance calculations.
- (U) Perform U.S. systems survivability/vulnerability simulations against multiple threats (e.g. laser and HPM).
- (U) Build satellite simulation models to support lethality and imagery efforts.
- (U) Begin laser system lethality assessment for an airborne laser in a theater missile defense role.
- (U) Develop a target vulnerability model for a typical theater missile defense target in the year 2000.

(U) Work Performed By: The Phillips Laboratory's Advanced Weapons and Survivability Directorate, Kirtland AFB, NM, performs in-house research and manages this program. The top five contractors are: RDA-Logicon, Marina Del Rey, CA; Science & Engineering Associates, Albuquerque, NM; Kaman Sciences Corporation, Albuquerque, NM; Bell Systems Engineering Division, Albuquerque, NM; and Orion International Technology, Inc., Albuquerque, NM.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) PE 0603319F, Airborne Laser Development.
- (U) PE 0603217C, Follow-on Systems.
- (U) PE 0603314A, High Energy Laser and Directed Energy Components.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: #0602601F
PE Title: Advanced Weapons

Budget Activity: #1 - Technology Base

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3326, Lasers and Imaging: This project examines the technical feasibility of moderate to high power lasers, associated optical systems, and long-range optical imaging concepts for Air Force mission requirements. This includes: advanced short wavelength laser devices for applications such as illuminators and imaging sources; advanced optical imaging techniques for target identification and assessment as well as aimpoint selection, maintenance, and damage assessment; laser device and optical component technology; and nonlinear optics (NLO) processes and techniques. Recently, long-range optical imaging emphasis has significantly increased.

(U) FY 1992 Accomplishments:

- (U) Evaluated high energy laser optical mirror coatings in a realistic environment.
- (U) Investigated new concepts for imaging geosynchronous and dim satellites.
- (U) Demonstrated advanced image enhancement, using NLO, with application to space object identification.
- (U) Completed development of a more compact advanced oxygen generator for chemical laser applications.
- (U) Optimized satellite image recovery software for data obtained from very large telescopes.
- (U) Developed acquisition approach and established a Maui supercomputer procurement team.
- (U) Performed laboratory demonstrations using NLO to generate the laser wavelength needed to excite the sodium layer in the upper atmosphere for compensation measurements.

(U) FY 1993 Planned Program:

- (U) Fabricate a device using the NLO generated sodium wavelength concept for use in demonstrations to improve the atmospheric compensation of the primary laser optical beam.
- (U) Complete development of a fast algorithm for passive imaging of uncooperative space objects.
- (U) Initiate effort to develop an in situ "health" monitoring system of high energy laser optical coatings.
- (U) Begin establishment of the Maui supercomputer capability.

(U) FY 1994 Planned Program:

- (U) Demonstrate NLO techniques for non-mechanical shifting of near-infrared laser wavelengths to the mid-infrared.
- (U) Begin implementation of a selected improved technique for imaging geosynchronous and dim satellites.
- (U) Complete the subscale advanced aperture sharing element development.
- (U) Complete proof-of-concept experiments for laser diode pumping of gas lasers to demonstrate an efficient method of generating specific wavelengths.
- (U) Complete establishment of Maui supercomputer capability.

(U) Work Performed By: The Phillips Laboratory's Lasers and Imaging Directorate, Kirtland AFB, NM, performs major in-house research and manages this program. The top five contractors are: RDA-Logicon, Marina Del Rey, CA; S Systems Corporation, Inglewood, CA; BDM, McLean, VA; Rockwell Power Services, Albuquerque, NM; and Applied Technologies, Albuquerque, NM.

(U) Related Activities:

- (U) PE 0602101N, Directed Energy Weapons.

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PE Title: Advanced Weapons

Budget Activity: #1 - Technology Base

- (U) PE 0602307A, Laser Weapon Technology.
- (U) PE 0603217C, Follow-on Systems.
- (U) PE 0603314A, High Energy Laser and Directed Energy Components.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

- 4. (U) Project 5797, High Power Technologies: This project explores unconventional weapon concepts using innovative technologies. Primary technology areas include high power microwaves (HPM), high energy plasmas such as compact toroids, and high energy pulse power.
 - (U) FY 1992 Accomplishments:
 - (U) Developed a HPM model to evaluate the potential for weaponization.
 - (U) Accelerated compact plasma toroids up to 500 Kilometers per second.
 - (U) Developed cathode technology for a HPM array capable of producing high energy at many pulses per second.
 - (U) Completed HPM tests on integrated circuits and semiconductor chips.
 - (U) Achieved multi-gigawatt (GW) power levels with gas and oil switched ultra-wideband HPM sources.

 - (U) FY 1993 Planned Program:
 - (U) Conduct multi-megajoule compact toroid experiments.
 - (U) Characterize target vulnerability to high power, narrow band HPM sources such as backward wave oscillators.
 - (U) Develop a high repetition rate wideband HPM test source using advanced switch and antenna technology.
 - (U) Continue analysis of semiconductor damage phenomenology and development of electromagnetic coupling codes to support hardening.
 - (U) Bring the initial space subsystem susceptibility modeling capability on-line and modify for use at HPM power levels.

 - (U) FY 1994 Planned Program:
 - (U) Develop a 100 GW switch.
 - (U) Complete updated space subsystem assessment model.
 - (U) Begin development of advanced wideband HPM sources.
 - (U) Validate HPM effects codes on U.S. and foreign systems to increase confidence in assessment predictions of systems unavailable for testing.
 - (U) Evaluate x-ray production with high energy compact toroids.

- (U) Work Performed By: The Phillips Laboratory's Advanced Weapons and Survivability Directorate, Kirtland AFB, NM, conducts major in-house research and manages this program. The top five contractors are: Maxwell Laboratories, Inc., San Diego, CA; RDA-Logicon, Marina Del Rey, CA; Rockwell Rocketdyne, Canoga Park, CA; Kaman Sciences Corporation, Albuquerque, NM; and Science & Engineering Associates, Albuquerque, NM.

- (U) Related Activities:
 - (U) PE 0602120A, Electronic Survivability and Fuzing Technology.
 - (U) PE 0602111N, Anti-Air Warfare, Anti-Surface Warfare Technology.
 - (U) PE 0602202F, Human Systems Technology.

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Program Element: #0602601F
PE Title: Advanced Weapons

Budget Activity: #1 - Technology Base

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 5. (U) Project 8809, Space Systems Survivability and Hardness Technology:
This project develops survivability/vulnerability technology for future space systems. This includes design analysis, systems response modeling, and methods for enhancing electrical and optical components survivability against a wide range of natural and hostile electromagnetic irradiation and space debris environments. Techniques will be developed to harden electronics against space and/or nuclear environment radiation effects. This project also provides the technology base for satellite survivability assessments through the development of potential failure models and computer simulations of multiple threat environments.
 - (U) FY 1992 Accomplishments:
 - (U) Validated advanced nuclear weapon models to predict prompt radiation dose-rates at high altitudes on space systems.
 - (U) Evaluated high temperature superconductors for space applications.
 - (U) Studied the applicability of special transistors for radiation hardened circuits.
 - (U) Identified/developed required materials data base for computer models of damage mechanisms.
 - (U) FY 1993 Planned Program:
 - (U) Implement multi-burst nuclear phenomenology computer code.
 - (U) Complete protection studies for space system components.
 - (U) Characterize nuclear and space debris effects on composite materials and other selected materials and space systems.
 - (U) Complete radiation evaluation of non-volatile memories and optical components.
 - (U) FY 1994 Planned Program:
 - (U) Deliver enhanced decay model for radiation survivability.
 - (U) Complete debris effects on satellite materials analysis.
- (U) Work Performed By: The Phillips Laboratory's Advanced Weapons and Survivability Directorate, Kirtland AFB, NM, performs in-house research and manages this program. The contractors are: RDA-Logicon, Marina Del Rey, CA; Mission Research Corporation, Santa Barbara, CA; and University of New Mexico, Albuquerque, NM.
- (U) Related Activities:
 - (U) PE 0602715H, Defense Nuclear Agency.
 - (U) PE 0603311F, Ballistic Missile Technology.
 - (U) PE 0603605F, Advanced Weapons Technology.
 - (U) PE 0604711F, Air Force Systems Survivability.
 - (U) PE 0603401F, Advanced Spacecraft Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602602F
PE Title: Conventional Munitions

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06AL Armament Directorate Operations	17,692	19,674	17,809	Cont	TBD
2068 Advanced Guidance Technology	7,487	5,411	16,549	Cont	TBD
2502 Ordnance Technology	8,635	5,711	6,489	Cont	TBD
2543 Weapons Effectiveness Methodology	1,356	967	1,080	Cont	TBD
2567 Aeromechanics Technology	<u>5,811</u>	<u>4,316</u>	<u>4,726</u>	<u>Cont</u>	<u>TBD</u>
TOTAL	40,981	36,079	46,653	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology exploratory development effort develops and establishes the feasibility of advanced technologies for air-to-air and air-to-surface conventional weapons to support non-nuclear Air Force missions. The program includes: (1) advanced fuzes, explosives, warheads, and advanced projectile technologies; (2) advanced weapon guidance and flight control technologies; (3) advanced low-drag, high performance weapon airframes; (4) conformal/internal weapons carriage and separation; (5) improved submunition dispensing concepts; (6) lethality and effectiveness assessments for advanced conventional weapons; (7) test instrumentation technologies; and (8) target scoring technologies. This program element also funds the management and support of the Air Force Wright Laboratory Armament Directorate at Eglin AFB, FL. Funding increase in Project 2068 reflects increased emphasis in air-to-surface weapon terminal guidance and increased simulation technology developments.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- (U) Project 06AL, Armament Directorate Operations: This project supports and complements all other projects and provides for management, support, and operation of Wright Laboratory's Armament Directorate, Eglin AFB, FL. It provides civilian salaries, transportation, rents, maintenance, communications, supplies and equipment, and facilities maintenance.
- (U) Project 2068, Advanced Guidance Technology: This project develops precision guidance technologies (i.e., synthetic aperture radar, laser radar, active/passive millimeter wave) for air-launched conventional weapons. It also develops advanced instrumentation technology and techniques necessary to test advanced weapon systems. Project payoffs include: adverse-weather and "launch and leave" guidance capability; increased accuracy; increased number of kills per sortie; increased aircraft survivability; improved reliability and affordability; reduced test costs; shorter development programs; and more thoroughly tested weapon systems.

(U) FY 1992 Accomplishments:

- (U) Completed breadboard optical pattern recognition system and established a dedicated laboratory for optical processing research.

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Program Element: #0602602F
PE Title: Conventional Munitions

Budget Activity: #1 - Technology Base

- (U) Completed time, space, position indicator data processor for use in improving test data acquisition on DOD test ranges.
- (U) Completed design and began fabrication of a millimeter wave research radar to develop seekers capable of detection and classification of ground targets.
- (U) Completed brassboard development and ground test of a subminiature telemetry system for test support and aircraft/weapons certification testing.
- (U) Completed flight test for non-cooperative vector scoring against a full-scale target drone.

- (U) FY 1993 Planned Program:
 - (U) Initiate an autonomous air-to-surface seeker algorithm development that uses optical processing.
 - (U) Establish a laser radar simulation capability to support seeker development and flight testing.
 - (U) Conduct multi-spectral radio frequency seeker simulation analysis.
 - (U) Initiate high speed video module development to replace cinematographic film with real-time, high speed video for weapons certification/development.
 - (U) Fabricate and flight test a subminiature telemetry system.
 - (U) Develop/test an electromagnetic sensor for blast characterization and battle damage assessment.

- (U) FY 1994 Planned Program:
 - (U) Complete fabrication of a millimeter wave research radar and begin testing.
 - (U) Initiate design of a breadboard seeker to demonstrate a passive radiometric capability for autonomous seekers.
 - (U) Begin definition of a solid state laser radar seeker using optical processing techniques for improved target recognition capability.
 - (U) Initiate integration and testing of a near-real-time synthetic aperture radar targeting capability into a direct attack munition.
 - (U) Initiate the planning, design, and development of weapon/seeker interfaces to networked simulations.
 - (U) Initiate weapon simulation development using data from inertial navigation systems/global positioning system guidance seeker flight tests.

- (U) Work Performed By: This project is managed by Wright Laboratory's Armament Directorate, Eglin AFB, FL. Major contractors are: Harris Corp., Melbourne, FL; Raytheon Co., Bedford, MA; Loral, Akron, OH; Electro Systems International, Kennesaw, GA; and Texas Instruments, Dallas, TX.

- (U) Related Activities:
 - (U) PE 0603601F, Conventional Weapons Technology.
 - (U) PE 0603238F, Air Defense/Precision Strike Technology Demonstration.
 - (U) PE 0602303A, Missile Technology.
 - (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
 - (U) PE 0604258N, Vector Scoring.
 - (U) PE 0604940D, Time, Space, Position Indicator Data Processor.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

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Program Element: #0602602F
PE Title: Conventional Munitions

Budget Activity: #1 - Technology Base

3. (U) Project 2502, Ordnance Technology: This project develops technologies for advanced weapon dispensers, submunitions, safe and arm devices, fuzes, explosives, and warheads for air-to-surface and air-to-air conventional weapons. The payoffs include: improved storage capability and transportation safety of fully assembled weapons; improved non-nuclear warhead and fuze effectiveness; improved submunition dispensing; and selectable multi-mode kill capability.
- (U) FY 1992 Accomplishments:
- (U) Developed two insensitive general purpose bomb explosives formulations (one melt cast, one cure cast) with a 1.6 Hazard Classification (i.e., allows larger quantities to be stored in one place and/or transported at a time).
 - (U) Formulated a less sensitive high performance explosive for submunitions.
 - (U) Transitioned an insensitive explosive for use in generic weapons safety tests.
 - (U) Developed advanced fuzing sensors for improved detonation and burst point control for low-observable airborne targets.
 - (U) Demonstrated multi-point warhead initiation employing shock conduction switch detonator technology and established feasibility of multi-mode warheads.
- (U) FY 1993 Planned Program:
- (U) Initiate a technology effort to defeat/disable chemical and biological agents in storage with minimal collateral damage.
 - (U) Develop/test a fuze to differentiate between different target media.
 - (U) Develop an analytical tool for calculating the blast effects of reactive warhead kill mechanisms in different targets.
 - (U) Initiate development of higher energy explosives for warheads subject to an adverse impact environment.
- (U) FY 1994 Planned Program:
- (U) Evaluate and test explosives formulations developed for a variety of different target defeat warheads.
 - (U) Test alternate explosive formulations to enhance warhead performance.
 - (U) Fabricate/test a target adaptable fuze using active decision-making logic.
 - (U) Develop high strength warhead designs for high velocity impacts.
- (U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB, FL, performs major in-house research and manages this project. Major contractors are: Martin Marietta, Orlando, FL; Honeywell, Hopkins, MN; Diversified Engineering Inc., Richmond, VA; Motorola Inc., Scottsdale, AZ; and KDI Precision Products, Cincinnati, OH.
- (U) Related Activities:
- (U) PE 0603601F, Conventional Weapons Technology.
 - (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
 - (U) PE 0604602F, Armament Ordnance Development.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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PE Title: Conventional Munitions

Budget Activity: #1 - Technology Base

4. (U) Project 2543, Weapons Effectiveness Methodology: This project assesses the lethality and effectiveness of current and planned air-to-surface and air-to-air conventional weapons technology programs, and assesses the vulnerability of targets against which our conventional weapons are designed. The payoffs include: improved technology planning; increased technology focus; and improved weapon designs.
- (U) FY 1992 Accomplishments:
- (U) Conducted testing to evaluate fixed target response to internal blast.
 - (U) Validated munitions effectiveness codes for complex structures and new scenarios.
- (U) FY 1993 Planned Program:
- (U) Complete characterization of blast effects in concrete structures.
 - (U) Extend effectiveness vulnerability assessment code to anti-materiel targets (e.g., air defense units).
- (U) FY 1994 Planned Program:
- (U) Extend effectiveness vulnerability assessment code to natural structures.
 - (U) Continue to study reactive material effects in targets.
- (U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB, FL, performs major in-house research and manages this project. Major contractors are: Denver Research Institute, Denver, CO; and LTV Aerospace and Defense, Dallas, TX.
- (U) Related Activities:
- (U) PE 0603307F, Air Base Survivability.
 - (U) PE 0603601F, Conventional Weapons Technology.
 - (U) PE 0604602F, Armament Ordnance Development.
 - (U) PE 0604604F, Submunitions Development.
 - (U) PE 0602624A, Weapons and Munitions Technology.
 - (U) PE 0602332N, Surface/Aerospace Weapons Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
5. (U) Project 2567, Aeromechanics Technology: This project develops technologies to improve the aerodynamic performance, survivability, and effectiveness of conventional air-to-surface weapons, air-to-air weapons, and advanced projectile technologies. These technologies provide: low-cost airframe/subsystem components and structures; reduced aircraft/weapons drag and radar signature; and advanced midcourse guidance equipment for advanced missile airframes.
- (U) FY 1992 Accomplishments:
- (U) Completed development of advanced guidance and modern control technologies (e.g., bank-to-turn steering) for low-observable missile configurations.
 - (U) Completed computational fluid dynamics store separation code to reduce cost of aircraft/weapons certification.
 - (U) Completed successful ring-laser gyro technology exploration for an air-to-air missile guidance system.

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Program Element: #0602602F
PE Title: Conventional Munitions

Budget Activity: #1 - Technology Base

(U) FY 1993 Planned Program:

- (U) Begin development of jet reaction control devices for highly maneuverable, compact, air-to-air missiles.
- (U) Begin development of low-drag, low signature, external weapon carriage techniques and release equipment.
- (U) Begin design and fabrication of a low-cost fiber optic gyro inertial measurement unit for tactical weapons.
- (U) Begin design and hardware fabrication of a low-cost integrated global positioning system/inertial navigation system with improved anti-jam capability.

(U) FY 1994 Planned Program:

- (U) Fabricate and begin ground tests of jet reaction control devices for air-to-air missiles.
- (U) Complete fabrication and test a low-cost fiber optic gyro inertial measurement unit for tactical weapons.
- (U) Complete fabrication of integrated global positioning system/ inertial measurement unit with high anti-jam capability.
- (U) Initiate advanced projectile technology designs.

(U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB, FL, performs major in-house research and manages this project. Major contractors are: McDonnell Douglas, St. Louis, MO; Loral Aeronutronic, Newport Beach, CA; Honeywell, Minneapolis, MN; Harris Corp., Melbourne, FL; and Raytheon, Sudbury, MA.,

(U) Related Activities:

- (U) PE 0603230F, Advanced Tactical Fighter.
- (U) PE 0603601F, Conventional Weapons Technology.
- (U) PE 0603238F, Air Defense/Precision Strike Technology Demonstration.
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
- (U) PE 0604602F, Armament Ordnance Development.
- (U) PE 0602111N, Anti-Air Warfare/Anti-Surface Warfare Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Command, Control, and Communications (C3)

Budget Activity: #1 - Technology Base

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
06RA Command, Control, and Communications (C3) Laboratory Operations	41,385	43,240	39,450	Cont	TBD
2338 Reliability Sciences Technology	4,290	4,652	6,000	Cont	TBD
4506 Surveillance Technology	7,925	7,332	11,144	Cont	TBD
4519 Communications Technology	3,740	4,174	9,195	Cont	TBD
4594 Information Technology	5,610	6,402	9,250	Cont	TBD
4600 Electromagnetic Technology	9,660	9,691	10,405	Cont	TBD
5581 Command and Control Technology	<u>6,670</u>	<u>6,962</u>	<u>10,513</u>	<u>Cont</u>	<u>TBD</u>
Total	79,280	82,453	95,957	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program is the primary source of new concepts, feasibility demonstrations, and exploratory technology for Air Force C3. Current developments include: increased operational availability of C3 systems through improving reliability, diagnostic capability, and electromagnetic atmospheric performance; improving effectiveness and survivability through secure communications; improving surveillance range and detection capabilities against low-observable threats and enemy electronic countermeasures; and improving the timeliness and quality of data for decision making. Projects address the following technology areas: reliability sciences; surveillance; communications; information; electromagnetics; and command and control. Increased FY 1994 funding supports the increased emphasis on C3 technologies that support the theater commander.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06RA, C3 Laboratory Operations: This project provides for the management, support, and operation of Rome Laboratory, Griffiss AFB, NY, and the two directorates of Rome Laboratory at Hanscom AFB, MA. It provides the non-reimbursable pay and related cost of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. Funds support and complement other projects within this PE.
2. (U) Project 2338, Reliability Sciences Technology: The Air Force needs technology that increases reliability and diagnostic capability for electronic devices and systems while assessing electromagnetic environmental performance. Payoffs are increased system availability and lower life cycle costs. This effort focuses on new silicon- and gallium arsenide-based technology to identify and eliminate design and fabrication characteristics that result in poor reliability. It develops equipment/system reliability and diagnostic techniques to be applied in development of military systems with improved operational

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Program Element: #0602702E
PE Title: Command, Control, and Communications (C3)

Budget Activity: #1 - Technology Base

readiness and supportability. Areas of emphasis include: techniques to design-in reliability; artificial intelligence for system maintenance; and computer-aided design for reliability, maintainability, and testability.

(U) FY 1992 Accomplishments:

- (U) Completed state-of-the-art reliability prediction models for electronic devices to assess the reliability of advanced devices when no previous reliability data exists.
- (U) Developed Time Stress Management Devices (TSMDs) that analyze and correct device design deficiencies and reduce operational systems maintenance actions.

(U) FY 1993 Planned Program:

- (U) Verify quality and the reliability prediction for gallium arsenide opto-electronic integrated circuits prior to applications to fielded active phased array radars or signal processors.
- (U) Develop applications for TSMDs to analyze and correct design deficiencies which result in Retest Duplicate maintenance actions in Air Force operational systems.

(U) FY 1994 Planned Program:

- (U) Develop general purpose, inexpensive, and reliable TSMDs with intelligent built-in-test that can realize significant system life cycle cost savings.
- (U) Conduct integration of robust design and diagnostic technologies for improved testability and life cycle support.
- (U) Expand assurance technology base to include multi-chip/wafer scale technology and develop approaches for product improvement into reliable/fault tolerant systems.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: General Electric, Pittsfield, MA; General Electric, Morristown, NJ; University of Maryland, College Park, MD; Honeywell Inc., Minneapolis, MN; and TRW, Redondo Beach, CA.

(U) Related Activities:

- (U) PE 0603617F, Command, Control, and Communications Applications.
- (U) PE 0604609F, Reliability and Maintainability Technology Insertion Program.
- (U) PE 0708026F, Producibility, Reliability, Availability, and Maintainability (PRAM).
- (U) This program has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4506, Surveillance Technology: The Air Force needs advanced ground/airborne system concepts and technologies to improve Air Force surveillance capabilities. Major exploratory development programs include: advanced line-of-sight radars; low-observable surveillance; and counter-countermeasures to defeat electronic warfare threats directed at surveillance systems; and technologies that will produce performance upgrades to existing systems. This project will develop enabling technologies needed to reduce the cost of advanced array radars capable of dealing with advanced (stealth) threats. Technology will focus on signal processing, signal generation and control, array antenna techniques, and low-cost solid state transmit/receive (T/R) modules. This project will demonstrate techniques for radar and electro-optical systems for low cross-section atmospheric targets in a severe

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Program Element: #0602702F

Budget Activity: #1 - Technology Base

PE Title: Command, Control, and Communications (C3)

jamming environment. A new initiative for sensor fusion will enhance the airborne warning and control system and the ground tactical air control system for improved target tracking for hand-off to fighters.

(U) FY 1992 Accomplishments:

- (U) Implemented an airborne multichannel, phased array, high fidelity, data collection system to provide real data necessary to more fully validate methods for detecting small targets in clutter and jamming.
- (U) Validated multimode/multispectral airborne sensor suite designs and technology to provide flexible surveillance of atmospheric, ground, and tactical missile targets.

(U) FY 1993 Planned Program:

- (U) Demonstrate an integrated transmit/receive (T/R) module to do multiple functions of signal generation, reception, and processing in a single package to lower system cost and increase reliability for ground/airborne applications.
- (U) Develop real-time fusion of signal information in a multispectral sensor to enhance target detection and tracking.
- (U) Develop and implement advanced signal processing algorithms and evaluate their performance through a distributed processing architecture to provide enhanced radar detection, tracking, and anti-jam performance.

(U) FY 1994 Planned Program:

- (U) Conduct passive multistatic sensor experiment to test airborne electronic support measures/bistatic surveillance concepts.
- (U) Develop high dynamic range digital beamformer receiver to improve target detectability in clutter.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: SENESIS, DeWitt, NY; Westinghouse Electric, Baltimore, MD; Syracuse Research Corp., Syracuse, NY; Raytheon Co., Sudbury, MA; and Calspan Corp., Buffalo, NY.

(U) Related Activities:

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4519, Communications Technology: The Air Force needs technologies that will provide global communications that enable the rapid application of air combat power via assured connectivity for timely, reliable, responsive, affordable transfer of information. This project will develop enabling technologies that support lightweight experimental communications such as antennas, solid state devices, and data links. Communications must provide transparent, user-friendly connectivity using all available communications media and providing all types of communications services including the ability to surge as necessary to support rapid build-up of U.S. presence abroad. This program provides the technologies for enduring multi-level, secure, seamless networks; advanced communications processors; anti-jam and low probability of intercept techniques; and modular, programmable, low-cost radios and terminals for ground, airborne, and space command, control, and communications

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Program Element: #0602702E

Budget Activity: #1 - Technology Base

PE Title: Command, Control, and Communications (C3)

across the electromagnetic and optical spectrums. It includes electronic and photonic technologies for advanced processors and devices, advanced network protocols, artificial intelligent communications management and control, and advanced algorithms and signal processing techniques.

(U) FY 1992 Accomplishments:

- (U) Completed integrated command, control, and communications optical processor design that will provide a major improvement in processing capability for communications systems and surveillance.
- (U) Demonstrated capability of beyond line-of-sight optical scatter communications for covert, compact communications.

(U) FY 1993 Planned Program:

- (U) Improve space communications data throughput under jamming using an optically-controlled null steering phased array antenna.
- (U) Initiate critical system brassboard for adaptive multimode smart radio.
- (U) Demonstrate network routing algorithms and techniques for enhanced communications reliability and efficiency for satellite communications systems.
- (U) Demonstrate three-dimensional (3-D) optical processor using holographic interconnects.

(U) FY 1994 Planned Program:

- (U) Demonstrate reconfigurable optical-to-optical interconnect with gain for optical communications systems.
- (U) Demonstrate 44 gigahertz photonic receiver for space communications.
- (U) Initiate development of neural networking algorithms to analyze network parameters to identify failures and threats.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Westinghouse Electric, Baltimore, MD; University of Massachusetts, Amherst, MA; Physical Optics Corp., Torrance, CA; Cornell University, Ithaca, NY; ITT Avionics Corp., Nutley, NJ; and Rockwell, Thousand Oaks, CA.

(U) Related Activities:

(U) PE 0303126F, Long Haul Communications.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4594, Information Technology: The Air Force needs technologies that improve and automate Air Force capabilities to process, fuse, and disseminate useful and timely information. This project improves recording, storage, and retrieval of high data rate, high volume data; develops signal processing for information deception and unintentional emissions; develops technology for correlation and fusion of multisource data; provides advanced processing techniques for receipt, correlation analysis, and display of target reports from advanced sensor systems; supports advanced weapon systems through the exploration of multispectral, multisource imagery; and provides advanced techniques for charting and geodesy data processing.

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Program Element: #0602702E

Budget Activity: #1 - Technology Base

PE Title: Command, Control, and Communications (C3)

(U) FY 1992 Accomplishments:

- (U) Developed natural language software for improving message handling and database manipulation.
- (U) Demonstrated random access and three-dimensional optical memory devices to improve data storage and retrieval.
- (U) Applied and demonstrated machine learning techniques to digital imagery for goal of 95% probability of correct classification of targets.

(U) FY 1993 Planned Program:

- (U) Apply a combined neural network/expert system to improve data analysis for indications and warning systems.
- (U) Demonstrate optical interconnects for optical memories to increase speed of operation and interface with digital computers for C3.
- (U) Complete integration of neural networks to automate the extraction of information from digital imagery.

(U) FY 1994 Planned Program:

- (U) Develop an electronic repository of data which can be updated from a range of multimedia sources to reduce human workload of manually transferring data.
- (U) Demonstrate natural language understanding software which utilizes incoming message traffic to extract relevant data and updates existing databases.
- (U) Demonstrate a common mapping system to assist in the targeting function.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Harris Corp., Melbourne, FL; Boeing Defense and SPC, Seattle, WA; State University-Rutgers, Piscataway, NJ; BBN Systems and Technology, Cambridge, MA; and PAR Government Systems Corp., New Hartford, NY.

(U) Related Activities:

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4600. Electromagnetic Technology: This project consists of three subsets of technology: electromagnetics; solid state sciences; and photonics. Future C3 surveillance, communications, and information processing systems will require improved technology for the generation, control, processing, and transmission of electromagnetic and optical energy to reduce system cost, improve system sensitivity, and increase processing rates. Promising technologies for improving C3 systems include: antennas; integrated optics; increased understanding of propagation and scattering of electromagnetic energy; and improved integrated components. This project develops a technology base for electronic and photonic devices and device materials for C3 systems; develops optical technology for electronic information processing and data storage, real-time target recognition, and processing of various space sensors; develops control techniques for large phased array antennas; develops technology for low-cost communications terminals; and characterizes phenomena for low-observable wide area or theater surveillance.

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Program Element: #0602702E

Budget Activity: #1 - Technology Base

PE Title: Command, Control, and Communications (C3)

(U) FY 1992 Accomplishments:

- (U) Developed spatial light modulator for phase-only correlator advanced development model to demonstrate hostile target identification capability.
- (U) Demonstrated performance monitoring of individual transmit/receive (T/R) modules in to show possibility of improvement by a factor of 100 in ground clutter rejection in surveillance radars.
- (U) Fabricated and evaluated a multichannel photonic processor to eliminate sidelobe jamming of an antenna.

(U) FY 1993 Planned Program:

- (U) Develop high temperature superconductor tunneling devices that will demonstrate an improved communications receiver in a smaller package.
- (U) Develop 94 and 120 gigahertz (GHz) monolithic heterostructure indium-based field effect transistors to increase the information transfer rate and range of advanced space communications systems.
- (U) Evaluate optical interconnects within an electronic computer to increase operational speed and reliability by a factor of 100.

(U) FY 1994 Planned Program:

- (U) Demonstrate large self-cohering high frequency array technology that will enhance radar return signals and enable the formation of directive beams to the target using new ionospheric clutter and coherence models.
- (U) Complete experimental confirmation of bistatic clutter and target phenomenology for improved target detectability.
- (U) Transition photonic beamforming technology into a critical experiment for optical control of phased arrays.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: U.S. Small Business Corp., San Antonio, TX; University of Rochester, Rochester, NY; SRI International, Menlo Park, CA; Honeywell Sensor and Systems, Minneapolis, MN; and University of Massachusetts, Amherst, MA.

(U) Related Activities:

(U) PE 0603617F, C3 Applications.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements:

(U) Nunn Amendment program with Australia to characterize ionospheric clutter.

7. (U) Project 5581, Command and Control (C2) Technology: The Air Force needs technologies that provide next generation battlefield commanders with improved processing and presentation of information for real-time battle management. This project develops enabling technologies for C3 time-critical theater air operations. Technologies being developed will increase the capability, quality, and reliability while reducing the cost of computer resources in C2 systems. This project develops advanced computer software modeled after human information processing and capable of providing vast improvement in military decision making. It also develops software engineering tools, software development methodologies, and software quality specification and assessment. It develops technology for distributed

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Program Element: #0602702E

Budget Activity: #1 - Technology Base

PE Title: Command, Control, and Communications (C3)

systems, including data bases, distributed operating systems, and fault tolerance mechanisms. Finally, it develops technologies for the enhancement and application of knowledge-based systems to military planning and software engineering.

(U) FY 1992 Accomplishments:

- (U) Demonstrated Knowledge-Based Software Assistant (KBSA) for formal software specification and verification to prove orders of magnitude improvement in software productivity are possible with KBSA technology.
- (U) Developed adaptive fault tolerance algorithms for graceful degradation in distributed computing systems for command and control (C2).
- (U) Developed techniques for automated changes to resource management policy in a distributed network for C2 systems survivability.

(U) FY 1993 Planned Program:

- (U) Develop capability to simultaneously control the data processing and communications resources in a distributed C2 system to provide load balancing and graceful performance degradation in a failure prone environment.
- (U) Develop/demonstrate a computer-based tool to generate production quality software directly from user-specified requirements to eliminate code and design errors and improve productivity by a factor of two.
- (U) Develop enhanced temporal reasoning capabilities, integrate with generation planning, and demonstrate in force employment/deployment planning.

(U) FY 1994 Planned Program:

- (U) Develop interactive data wall presentation medium for supporting C2 experimentation.
- (U) Demonstrate capabilities for plan element reuse enabled by case-based reasoning techniques.
- (U) Determine feasibility of a global resource management system that can uniformly control all assets of a distributed information system including data processing, data base, and communications.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: SRI International, Menlo Park, CA; General Electric, Schenectady, NY; Massachusetts Institute of Technology, West Newton, MA; Park Mathematical, Carlisle, MA; and Kestrel, Palo Alto, CA.

(U) Related Activities:

(U) PE 0603617F, Command, Control, and Communications Applications

(U) PE 0303401F, Communications-Computer Systems (C-CS) Security.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0602790F

Budget Activity: #1 - Technology Base

Title: Small Business Innovation Research (SBIR)
and Small Business Technology Transfer Pilot Program (STTR)

A. (U) RESOURCES (\$ In Thousands)

Project Number & Title	FY1992 Actual	FY1993 Actual	FY1994 Estimate	To Complete	Total Program
SBIR	\$66,775*	\$137,525*	\$136,423	CONT	TBD
STTR	0	0	4,553	CONT	TBD
TOTAL	\$66,775	\$137,525	\$140,976	CONT	TBD

* Previously funded in PE65502F

B. (U) BRIEF DESCRIPTION OF ELEMENT: Public Law 102-564 mandates that a certain percent of the extramural portion of the Research, Development, Test and Evaluation (RDT&E) budget be set aside for Small-Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR). SBIR contracts are awarded to small businesses and STTR contracts will be awarded to small businesses in conjunction with private research institutions for various research topics submitted by Air Force (AF) laboratories and research centers consistent with the AF Investment Strategy. The SBIR was designed and developed as a "pro small business" engine for change and innovation. STTR acts to include universities and other institutions as participants. The programs' primary goals are to stimulate technological innovation within small businesses to meet Air Force (AF) and government Research & Development (R&D) needs. SBIR and STTR also work to increase private sector commercialization of technology developed from federal R&D projects. Contracts are awarded competitively. Winning proposals are judged by experts in the field and must show superior scientific/technical quality. Special emphasis is given to innovation and originality of approach and the qualifications of the principal investigator and other key staff.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) SBIR:

Public Law 102-564 mandates that a percent of the extramural portion of the Research, Development, Test and Evaluation (RDT&E) budget be set aside for Small Business Innovation Research (SBIR).

(U) FY1992 Accomplishments:

- (U) 326 SBIR contracts were awarded in the following categories: **Defense Critical Technology**-Semiconductor Materials and Microelectronic Circuits, Software Producibility, Parallel Computer Architectures, Machine Intelligence/Robotics, Simulation and Modeling, Photonics, Passive Sensors, Sensitive Radar, Signal Processing, Signature Control, Weapons

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Program Element: 0602790F

Budget Activity: #1 - Technology Base

Title: Small Business Innovation Research (SBIR)
and Small Business Technology Transfer Pilot Program (STTR)

System Environment, Data Fusion, Computational Fluid Dynamics, Air-Breathing Propulsion, Pulsed High Power, Hypervelocity Projectiles, High Energy Density Materials, Composite Materials, Superconductivity, Biotechnology Materials and Processes; **AF Critical Technology-** Hypersonics, High Energy Lasers (Chemical and Solid State), Toxicology, Rocket Propulsion; **Environment; Logistics.**

- (U) Many successes have resulted from these SBIR research efforts, including the following:
 - (U) Developed a promising electronic x-ray imaging technology (EXIT) that may replace both film and real-time imaging modalities and industrial and medical radiography.
 - (U) Developed an ultrasonic tactile sensor array for the Dexterous Hand which enhances efforts to use telerobotics to give workers access to hazardous environments.
 - (U) Developed a software package, name DYNAMAN for the prediction of human body dynamics during aircraft ejection, aircraft crashes, automobile accidents, and other hazardous events.
 - (U) Developed the "Eagle Eye", the first night vision goggle designed with a look-through display that permits virtually unobstructed viewing of the outside world simultaneously with the intensified image.
 - (U) Developed a modular data acquisition and recording system (MDARS) which offers the potential for reducing the cost of aerodynamic testing. MDARS will allow force, temperature, heat transfer, pressure and other data to be obtained simultaneously and provided immediately to engineers in desired units.
 - (U) Fabricated, characterized, and evaluated bismuth-strontium-calcium-(dysprosium)-copper-oxide tri-layer superconductors and determined their applicability to optically controlled (modulated) microwave delay lines.

(U) FY1993 Planned Program:

- (U) 650 contracts will be awarded for SBIR in the following thrust areas: **Major DOD Thrusts-**Global Surveillance and Communications, Precision Strike, Air Superiority and Defense, Training and Readiness, More Efficient Acquisition; **Additional Major Air Force Science & Technology Thrusts-**Strategic Deterrence, Air Power Projects, Assured Access to Space, Environmental Quality; **Logistics Research Technology.** Many of the contract awards will be continuing efforts of some notable FY92 research:

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Program Element: 0602790E

Budget Activity: #1 - Technology Base

Title: Small Business Innovation Research (SBIR)
and Small Business Technology Transfer Pilot Program (STTR)

- (U) Design, fabricate, and evaluate low loss, high isolation switches that are compatible with high temperature superconductor (HTS) technology and integrate one switching approach into two microwave subsystems for delivery to the government.
- (U) Demonstrate a Distributed Interactive Simulation (DIS) capability in the Integrated Test Bed (ITB). The DIS will allow dissimilar simulators distributed over a large geographical area to interact in a real-time warrior-in-the-loop team environment for the purpose of training, equipment development, or equipment evaluation.
- (U) Develop a model which will be used to predict laser eye damage and its effect on pilot performance by predicting the decrease in acuity due to laser lesion in the foveal region.
- (U) Develop a Membrane Sampling System to concentrate toxic environmental compounds for raman spectroscopy analysis. This monitoring system could provide a potential on-site analysis capability for pesticides. The research has been endorsed by EPA.
- (U) Special emphasis has been placed on environmental research and research dealing with dual-use technologies, technology transition, and technology transfer.

(U) FY1994 Planned Program:

- (U) 650 contracts will be awarded for SBIR addressing Department of Defense/AF Major Science & Technology Thrusts and DOD Critical Technologies as follows: **Thrusts**-Global Surveillance and Communications, Precision Strike, Air Superiority and Defense, Sea Control and Undersea Superiority, Advanced Land Combat, Synthetic Environments, Technology for Affordability; **Technologies**- Computers, Software, Sensors, Communications Networking, Electronic Devices, Environmental Effects, materials and Processes, Energy Storage, Propulsion and Energy Conversion, Design Automation, Human-System Interfaces. Further emphasis will be placed on an outreach effort and commercialization of dual-use technologies.

(U) Program to Completion

- (U) This is a continuing program.

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Program Element: 0602790F

Budget Activity: #1 - Technology Base

Title: Small Business Innovation Research (SBIR)
and Small Business Technology Transfer Pilot Program (STTR)

2. (U) STTR:

Public Law 102-564 mandates that a percent of the extramural position of the Research, Development, Test and Evaluation (RDT&E) budget be set aside for Small Business Technology Transfer (STTR).

(U) FY 1992 Accomplishments:

Not applicable

(U) FY 1993 Accomplishments:

Not applicable

(U) FY 1994 Planned Program:

- (U) This program is a new start.
- (U) 60 STTR contracts will be solicited and awarded consistent with AF/DOD Investment Strategy and emphasizing dual-use technologies.

D. (U) Work Performed By: All small businesses who are awarded contracts.

E. (U) COMPARISON WITH FY1993 DESCRIPTIVE SUMMARY:

Not applicable

F. (U) RELATED ACTIVITIES:

Not applicable

G. (U) OTHER APPROPRIATION FUNDS:

Not applicable

H. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

Not applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603106F
PE Title: Logistics Systems Technology

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2745 Logistics for Combat Weapon Systems Maintenance and Support	280	3,739	08	Cont	TBD
2940 Technology for Design and Maintenance	4,793	6,886	5,984	Cont	TBD
2950 Improved Logistics and Maintenance Performance	<u>7,844</u>	<u>3,389</u>	<u>4,426</u>	<u>Cont</u>	<u>TBD</u>
Total	12,917	14,014	14,318	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology PE develops and demonstrates technology to reduce the cost and improve the design, acquisition, and supportability of current and future weapon systems. This PE will improve the way maintenance and support considerations are designed into weapon systems and make engineering, product support, and maintenance data electronically available throughout the lifetime of the weapon systems. It will: provide more realistic simulation-based logistics planning and combat capability assessment models; provide critical risk-reduction technology; and accelerate development and implementation of near-term logistics technology to shorten the time needed to meet priority logistics supportability requirements for existing systems. The focus also includes test and diagnostic technologies, flight-line support, critical aircraft battle/accident damage assessment, and repair technology challenges. Additionally, it will demonstrate military aircraft fire suppression agents.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2745, Logistics for Combat Weapon Systems Maintenance and Support: This project develops, demonstrates, and transitions technology to improve the performance and supportability of Air Force weapon systems in both peacetime and deployed wartime environments. This project will develop and demonstrate the technologies necessary to enhance our capability to rapidly return battle damaged aircraft to a combat-ready status. In addition, this project will conduct a fire and explosion agent identification and test program for replacement of Halon 1301.

(U) FY 1992 Accomplishments:

- (U) Conducted preliminary assessment of logistics supportability impacts of reorganizing the Air Force into Composite Wings.
- (U) Completed a technology development plan to support rapid aircraft battle damage assessment and repair (ABDAR).

(U) FY 1993 Planned Program:

- (U) Develop plan for Halon 1301 agent replacement program and conduct initial laboratory-scale screening tests.
- (U) Develop plan to demonstrate methods for assessing and repairing battle/accident damaged aircraft when away from full maintenance facilities.
- (U) Conduct small-scale feasibility demonstrations of new ADBAR methods for advanced materials.

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Program Element: #0603106F
PE Title: Logistics Systems
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) FY 1994 Planned Program:
 - (U) Begin tests of replacement agents for Halon 1301 to extinguish fires in aircraft dry bays.
 - (U) Complete selection of candidate Halon 1301 replacement agents.
 - (U) Begin development of battle damage repair techniques for composites and low-observable materials.
- (U) Work Performed By: In-house technical work is performed and managed by Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are yet to be selected.
- (U) Related Activities:
 - (U) PE 0602205F, Personnel, Training, and Simulation.
 - (U) PE 0602202F, Human Systems Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 2940, Technology for Design and Maintenance: This project develops new technologies that will enable design, procurement, repair, and modification of more supportable and affordable weapon systems. These technologies permit integration of design trade off decisions among survivability, producibility, and supportability including development and use of simulations to allow assessment of system supportability impacts while initiatives are still in the concept design stage. Sample payoffs include a 50-1 return on investment by preventing costly manufacturing rework and design flaws through better initial design, 50% reductions in retrofit costs for modifications, and large reductions in support costs.
 - (U) FY 1992 Accomplishments:
 - (U) Developed reliability and maintainability design assessment tools for aircraft modifications which will decrease system support costs.
 - (U) Completed final demonstration of Integrated Design Support software which facilitates a paperless system design.
 - (U) FY 1993 Planned Program:
 - (U) Develop technology to manage digital technical data during the modification and repair of existing systems, greatly reducing costs.
 - (U) Develop advanced information modeling, engineering design, and process simulation tools required for weapon systems support, component re-engineering, and two-level maintenance operations.
 - (U) FY 1994 Planned Program:
 - (U) Extend development and demonstration of technology to help manage digital technical data during modification and repair of existing weapon systems.
 - (U) Develop and demonstrate methods to permit system and capability simulations to assess system supportability in the concept formulation phase.
 - (U) Demonstrate preliminary software system for defining maintenance requirements prior to concept formulation.

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Program Element: #0603106F
PE Title: Logistics Systems
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) Work Performed By: Performed and managed by the Armstrong Laboratory, Wright-Patterson AFB, OH. The major contractors are: Hughes Aircraft, San Diego, CA; Boeing Computer Services, Seattle, WA; NCI Information Systems, McLean, VA; BBN, Cambridge, MA; and Knowledge-Based Systems Inc., College Station, TX.
- (U) Related Activities:
 - (U) PE 0602205F, Personnel, Training, and Simulation.
 - (U) PE 0604740F, Computer Resource Management Technology.
 - (U) PE 0708011F, Manufacturing Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 2950, Improved Logistics and Maintenance Performance: This project develops technologies that will improve logistics and maintenance support including: development and demonstration of critical risk-reduction technology essential to field and depot maintenance operations; implementation of near-term logistics technology to shorten the time between user requirement and usable product delivery; and developing and field demonstrating technologies for the flightline maintenance technician. This includes technology that will allow replacement of the paper-based Technical Order System and integration of all technical and support information required by the technician to inspect, troubleshoot, repair, and report actions taken through use of a hand-held computer maintenance aid. Estimated savings are in the hundreds of millions of dollars for both operational commands and depot maintenance operations. Technologies developed in the project are closely coordinated with all three Services and products are now being applied to many current and future systems such as the F-16, Joint Surveillance and Target Attack Radar System, B-2, F-22, and the Army M1A1 tank. Commercial industry and the Federal Aviation Administration are also applying these technologies to improve maintenance and support of airliners and automobiles.
 - (U) FY 1992 Accomplishments:
 - (U) Developed preliminary plan for field-test of technology for integrating maintenance information at Luke AFB, AZ; reviewed and approved detailed design in support of field-test.
 - (U) Completed a successful limited scope joint-Service (Air Force/Navy/Marine Corps) field test of integrated maintenance diagnostics and specifications for electronic technical manuals.
 - (U) FY 1993 Planned Program:
 - (U) Conduct base-level integrated field test on an F-16 demonstrating and validating integrated maintenance technology.
 - (U) Analyze the payoff of integrated information aiding for training maintenance technicians on-the-job.
 - (U) Identify and evaluate opportunities for near-term transition of advanced hand-held troubleshooting aids to support the new Air Force concept of two-level aircraft maintenance.

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Program Element: #0603106F
PE Title: Logistics Systems
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) FY 1994 Planned Program:
 - (U) Assess logistics and maintenance support requirements for battle damaged aircraft.
 - (U) Develop preliminary plans for a field demonstration of integrated technical information.
 - (U) Develop preliminary information modeling and user requirements analysis for implementation of electronic technical data to support programmed depot maintenance.
- (U) Work Performed By: Work performed and managed by the Armstrong Laboratory, Wright-Patterson AFB, OH. The major contractors are: ARC, Dayton, OH; GDE Systems, San Diego, CA; Lockheed, Fort Worth, TX; RJO Corp., Dayton, OH; Robins-Gioia Inc., Alexandria, VA; NCI, Dayton, OH; and McDonnell Douglas, St. Louis, MO.
- (U) Related Activities:
 - (U) PE 0602205F, Personnel, Training, and Simulation.
 - (U) PE 0207219F, Advanced Tactical Fighter.
 - (U) PE 0604708F, Generic Integrated Maintenance Diagnostics Systems.
 - (U) PE 0603721N, Integrated Diagnostic Support.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603112F Budget Activity: #2 - Advanced Technology Development
 PE Title: Advanced Materials for Weapon Systems

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2100 Laser Hardened Materials	8,782	9,228	8,752	Cont	TED
3153 Nondestructive Inspection Development	2,252	3,364	3,196	Cont	TBD
3946 Materials Transition	<u>1,539</u>	<u>4,087</u>	<u>3,877</u>	<u>Cont</u>	<u>TBD</u>
Total	12,573	16,679	15,825	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Advanced Technology Development program develops and demonstrates laser hardening techniques, non-destructive inspection/evaluation (NDI/E) technologies, and advanced aerospace materials. The overall technical plan and investment strategy is to meet future technology needs. Technology options are developed to answer Air Force needs in the following areas: laser hardening materials and designs to protect aircrew eyes, sensors, and aeronautical/aerospace systems; enhanced NDI/E techniques to detect failure-causing defects and conditions in warfighting systems; and necessary advanced materials processing, characterization, and scale-up data to reduce their transition time into system applications and to achieve their ready acceptance by designers. The new technologies are required to protect systems and personnel against all laser threats, to reliably inspect aeronautical structures, and to improve operational performance, reliability, affordability, and supportability of current and advanced warfighting systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2100. Laser Hardened Materials: Develops new materials and concepts for protecting Air Force assets against laser radiation. Assets include aircrews, munitions, target acquisition systems, reconnaissance and navigational sensors, transparencies, and structures. The goal is to ensure mission capability before, during, and after laser exposure. Specific goals include protecting automated subsystems against interference (spoofing), assuring subsystems receive complete and accurate information (jamming protection), and preventing functional damage to systems and physical damage to aircrews. The worldwide laser market is rapidly expanding with easy export to any nation. Survivability solutions must account for a variety of lasers facing a mission. Lasers can be classified as low or high energy and continuous wave or short duration pulses. Lasers which originally could only emit at a single wavelength can now be tuned to emit a number of different wavelengths. Current protection is only capable of countering a limited portion of the laser threat. Concepts are demonstrated on representative hardware to ensure that validated

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Program Element: #0603112F
PE Title: Advanced Materials for
Weapon Systems

Budget Activity: #2 - Advanced Technology
Development

hardening options are available for transition to Air Force systems.

(U) FY 1992 Accomplishments:

- (U) Transitioned optical bandpass filters with metallic submicron arrays to infrared and optical window developers.
- (U) Fabricated conceptual broadband visors, spectacles, and goggles for eye protection against lasers.
- (U) Developed and demonstrated materials for lightweight hardened night vision goggles.
- (U) Completed night capable fixed wavelength integrated holographic devices for eye protection.
- (U) Evaluated optical fuses for laser radar hardening.
- (U) Completed design of advanced optical limiter devices to protect sensitive detectors from pulsed lasers.

(U) FY 1993 Planned Program:

- (U) Transition laser rejection coating for lenses in new Air Force spectacles.
- (U) Demonstrate laser resistant, high temperature transparency material for inventory aircraft retrofit.
- (U) Fabricate imaging elements for next generation targeting systems in fighter/bombers.
- (U) Package and transition appropriate optical limiter device technology to sensor hardening programs and developers.

(U) FY 1994 Planned Program:

- (U) Characterize materials for laser hardening for helmet-mounted displays.
- (U) Conduct full-scale performance and laser survivability testing of a hardened laser radar breadboard.
- (U) Develop high dynamic range, low threshold optical switches for low penalty protection of airborne sensors.
- (U) Scale-up laser hardened transparency material for improved durability and laser survivability.

(U) Work Performed By: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The top five contractors are: Hughes Aircraft Co., El Segundo, CA; McDonnell-Douglas Corp., St. Louis, MO; Lawrence Associates Inc., Dayton, OH; Polaroid Corp., Cambridge, MA; and GE Astrospace, King of Prussia, PA.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0604706F, Life Support System.
- (U) PE 0708011F, Industrial Base Program.
- (U) Coordinated with other Department of Defense and government agencies through the Tri-Service Laser Hardening Materials and Structures Working Group and the Joint Service Agile Laser Eye Protection Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0603112F
PE Title: Advanced Materials for
Weapon Systems

Budget Activity: #2 - Advanced Technology
Development

2. (U) Project 3153, Nondestructive Inspection Development: Develops and demonstrates advanced nondestructive inspection/evaluation (NDI/E) methods and procedures to accurately monitor performance integrity and to detect failure causing defects and conditions in weapon system components and materials. NDI/E capabilities greatly influence and/or limit many designs, manufacturing processes, and maintenance practices. Comparison of Air Force requirements with existing inspection capabilities reveals serious deficiencies. Reduction in the number of warfighting systems by deactivating fighter wings and need for rapid sortie generation demand an ability to perform real-time nondestructive inspections faster than current capability. This project provides technology to satisfy critical Air Force requirements for increased reliability and cost-effectiveness at both the field and the depot maintenance levels, as well as assuring the manufacturing quality, integrity, and safety requirements.

(U) FY 1992 Accomplishments:

- (U) Completed demonstration of backscatter imaging x-ray computed tomography for in-depth structural inspection.
- (U) Completed the computed tomography advanced development program for determining quality and performance of metallic castings.
- (U) Assembled first detectors for portable real-time filmless x-ray NDI of aircraft structures.

(U) FY 1993 Planned Program:

- (U) Complete demonstration of the computed tomography advanced technology.
- (U) Complete preliminary design of the portable real-time filmless x-ray NDI technology validation hardware.
- (U) Continue developing ultrasonic NDI technologies for affordable inspection of large composite airframes.

(U) FY 1994 Planned Program:

- (U) Complete development of a full-scale portable real-time filmless x-ray NDI model.
- (U) Complete development of contact ultrasonic NDI technologies for large composite structures.
- (U) Evaluate laser generated ultrasound NDI technologies for non-contact inspection of composite airframes.

- (U) Work-Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this program. The contractors are: Boeing Aerospace Co., Seattle, WA; General Dynamics, Ft. Worth, TX; and McDonnell Aircraft Co., St. Louis, MO.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3946, Materials Transition: Develops the necessary processing and scale-up data on new classes of advanced materials

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Program Element: #0603112F
PE Title: Advanced Materials for
Weapon Systems

Budget Activity: #2 - Advanced Technology
Development

to shorten the transition time into system applications. Materials are characterized to provide the detailed engineering data and fatigue/failure behavior required for the intended applications.

(U) FY 1992 Accomplishments:

- (U) Developed casting technique for single crystal nickel aluminide (NiAl) turbine engine blades.
- (U) Established technology transition plan for corrosion database of advanced materials.
- (U) Developed ceramic fiber processing technique for high temperature applications.
- (U) Demonstrated organic matrix composite feasibility on a turbine engine outer flap and engine shroud.

(U) FY 1993 Planned Program:

- (U) Demonstrate thermally resistant aircraft camouflage coatings on aircraft.
- (U) Complete materials design database for infrared (IR) windows.
- (U) Develop ceramic fiber database for design of engine nozzle components.
- (U) Develop non-toxic corrosion preventive aircraft component coatings.

(U) FY 1994 Planned Program:

- (U) Complete mechanical tests of a NiAl single crystal turbine blade.
- (U) Complete database on high temperature organic matrix composites with high strength graphite fibers.
- (U) Transition ceramic fiber composite materials for engine tests.
- (U) Develop corrosion data on titanium aluminide intermetallic materials.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this program. The main contractors are: General Electric Aircraft Engines, Evendale, OH; University of Dayton, Dayton, OH; Pratt & Whitney Aircraft, West Palm Beach, FL; Texas Instruments, Dallas, TX; General Research Corp., Santa Barbara, CA; Westinghouse Electric Corporation, Orlando, FL; Nichols Research Corporation, Dayton, OH; and Boeing Aircraft Co., Seattle, WA.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603202F, Aerospace Propulsion Subsystem Integration.
- (U) PE 0603203F, Advanced Infrared Search and Track.
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603202F Project Number: 668A
PE Title: Aircraft Propulsion Budget Activity: #2 - Advanced
Subsystem Integration (APSI) Technology Development

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Aircraft Propulsion Subsystem Integration (APSI)	25,279	27,279	28,004	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This Science and Technology program element develops and demonstrates gas turbine propulsion system technologies applicable to a broad range of aircraft. The APSI program has three distinct tasks. Task I develops affordable system component technology such as low pressure fans and low pressure turbines (LPT), engine controls, and nozzles. Task II includes demonstrator engines such as the Joint Technology Demonstrator Engine (JTDE) for manned systems and the Joint Expendable Turbine Engine Concept (JETEC) for cruise missile applications. These demonstrator engines apply the core technology developed under the Advanced Turbine Engine Gas Generator (ATEGG) program. Task III focuses on the system integration aspects of inlets, nozzles, engine/airframe compatibility, and low-observable technologies. This program will provide aircraft with: potential for longer range, higher cruise speed with lower specific fuel consumption; surge power for successful engagements; high sortie rates with reduced maintenance; reduced life cycle cost; and improved survivability resulting in increased mission effectiveness. The APSI program supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative. IHPTET is a three phase, totally integrated DOD, DARPA, NASA, and industry effort focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides intermediate technology transition for military turbine engine upgrades and derivatives and has the added benefit of enhancing the U.S. turbine engine industry's international competitiveness.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed extensive operability/durability tests on demonstrator engines with combinations of hollow swept fans, a composite fan casing, metallic and carbon/carbon LPT, a high work/lightweight LPT blade attachment, and multivariable controls.
- (U) Completed engine tests on lightweight metal matrix composite support structures demonstrating increased vibration damping capability with a 25% (80 pounds) weight reduction.
- (U) Completed tests of carbon/carbon turbine for man-rated engines providing 45% weight reduction and total elimination of low pressure turbine cooling air.

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Program Element: #0603202F

Project Number: 668A

PE Title: Aircraft Propulsion

Budget Activity: #2 - Advanced

Subsystem Integration (APSI)

Technology Development

- (U) Completed preliminary design of a low subsonic/supersonic fuel consumption and high thrust-to-weight capability for tactical fighters.
 - (U) Completed fabrication/started assembly of an expendable demonstrator engine with an uncooled carbon/carbon turbine rotor.
2. (U) FY 1993 Planned Program:
- (U) Design and fabricate an advanced capability exhaust system incorporating composite and metallic structures technology providing significant reductions in weight, cooling flow, cost, and observables for man-rated systems.
 - (U) Fabricate supercooled turbine components capable of a three-to five-fold life improvement or a 20% increase in thrust for current fighter engine upgrades and derivatives.
 - (U) Complete detailed design and initiate fabrication of a next generation expendable standoff missile demonstrator engine with a capability of 70% specific thrust improvement and 30% reduction in fuel consumption.
 - (U) Complete separate designs of the next generation Joint Technology Demonstrator Engine (JTDE) configuration.
 - (U) Fabricate hollow titanium metal matrix composite turbine engine fan blades to provide a 30% weight savings and improve efficiency.
3. (U) FY 1994 Planned Program:
- (U) Test an advanced spherical convergent flap nozzle.
 - (U) Assemble, instrument, and prepare to test supercooled turbine components.
 - (U) Complete detailed design of next generation JTDE configurations which will include a 60% thrust-to-weight improvement.
 - (U) Demonstrate fighter engine technologies with a 33% increase in thrust-to-weight and 20% fuel savings. Technologies include hollow metal matrix composite fan blades, transpiration cooled turbine vanes, and multifunctional nozzle components.
 - (U) Test the first ever composite turbine engine fan/compressor intermediate case providing a 20% weight savings and improved vibration resistance.
4. (U) Program to Completion: This is a continuing program.
- D. (U) WORK PERFORMED BY: This program is managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The current contractors involved in this program are: Allison Gas Turbine Division, Indianapolis, IN; Garrett Engine Division, Phoenix, AZ; General Electric, Evendale, OH; Pratt & Whitney Aircraft, West Palm Beach, FL; Teledyne CAE, Toledo, OH; and Williams International, Walled Lake, MI.

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Program Element: #0603202F Project Number: 668A
PE Title: Aircraft Propulsion Budget Activity: #2 - Advanced
Subsystem Integration (APSI) Technology Development

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The initial testing of expendable standoff missile demonstrator engines has been pushed out to FY 1995 due to reallocation of funding to accommodate fighter engine Advanced Technology Transition Demonstrators (ATTDs) and the Congressional recision.
2. (U) SCHEDULE CHANGES: Expendable engine testing will have approximately a two year delay due to the funding reallocations.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603112F, Advanced Materials for Weapons Systems.
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) PE 0602122N, Aircraft Technology.
- (U) PE 0603217N, Air Systems Advanced Technology Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | | |
|---------|---|----------|
| 1. (U) | Fabricate hollow metal matrix composite fan blades | Feb 1993 |
| 2. (U) | Complete fabrication of spherical convergent flap nozzle | Jun 1993 |
| 3. (U) | Complete detailed design of man-rated super-cruise engine | Dec 1993 |
| 4. (U) | Test super cooled turbine components for current fighter engine upgrades and derivatives | Dec 1993 |
| 5. (U) | Complete infrared signature test on missile demonstrator engine | Jan 1994 |
| 6. (U) | Complete Integrated High Performance Turbine Engine Technology (IHPTET) Phase I turbofan/turbojet goal demonstration (+30% thrust to weight (T/W), -20% fuel burn (FB)) | Mar 1994 |
| 7. (U) | Initiate design/fabrication of nozzle components for turbine engine derivative/upgrades | Jun 1994 |
| 8. (U) | Complete final design of IHPTET Phase II demonstrator for manned systems (overall goals of +60% T/W, -30% FB) | Mar 1995 |
| 9. (U) | Complete fabrication of a reduced signature engine nozzle | Apr 1995 |
| 10. (U) | Complete fabrication and assemble next generation missile demonstrator engines | Jun 1995 |
| 11. (U) | Initiate structural assessment testing of an exhaust system technology base for tactical aircraft upgrade/derivatives | Dec 1995 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
69CK Advanced Electronics	5,280	5,797	5,670	Cont	TBD
69DF Attack Management	5,268	6,262	5,822	Cont	TBD
665A Electro-Optical Targeting Sensors	6,472	15,037	25,588	Cont	TBD
1177 Target Recognition	5,450	8,465	7,254	Cont	TBD
2334 Airborne Radar Electronic Counter-Countermeasures	4,744	4,585	4,538	Cont	TBD
2345 Covert Airborne Communications	5,604	0	354	Cont	TBD
Total	32,818	40,146	49,226	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Future military force structures must contain combat aircraft able to defeat increasingly sophisticated active and passive countermeasures, destroy a wide variety of targets, and perform complex missions more reliably with less logistics support. This program addresses these needs by developing and demonstrating advanced electro-optical sensors for target acquisition and tracking, technologies and techniques for target identification and recognition, electronic counter-countermeasures (ECCM) for tactical airborne radars, covert airborne communications and aircraft internetting to provide for sharing of situation information for improved mission coordination and force multiplication, fire control/weapon delivery technologies and techniques for air and ground targets, and related electronic devices, with focus on providing avionics technology for flexible, multi-function/multi-mission aircraft that can safely penetrate threat areas, destroy multiple ground targets per pass, and perform air combat with positive beyond visual range detection and identification of targets within a complex mix of look-alike friendly, neutral, and enemy aircraft. Technology emphasis is on critical active and passive electro-optical sensors required to increase ability to detect, locate, and target airborne and fixed/mobile (stationary) time-critical ground targets, and on subsystems that may be quickly adapted to changes in target signatures and background environments. Increased emphasis began in FY 1993 on development and demonstration of passive infrared (IR) search and track sensor and low-observable window technology. In FY 1994, final design, component fabrication, and test will be accomplished.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 69CK, Advanced Electronics: Develops devices and components that improve performance, reliability, and affordability of radar, communication, and electronic warfare systems. This includes monolithic solid state transmit/receive modules for

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Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Budget Activity: #2 - Advanced Technology
Development

airborne radar, high-speed analog-to-digital converters and advanced memory/logic for electronic countermeasures (ECM), high reliability power distribution, microwave and microelectronics packaging and interconnect techniques, and integration of laser radar sources and detector arrays.

(U) FY 1992 Accomplishments:

- (U) Demonstrated high volume production techniques of low-cost transmit/receive (T/R) module housing based on advanced materials for radar and electronic warfare technology.
- (U) Completed development and demonstration of a radar power module with 95 percent power conversion efficiency.
- (U) Provided microwave (MW) devices and circuits for airborne radar and electronic warfare technologies.

(U) FY 1993 Planned Program:

- (U) Demonstrate packaging and interconnect design for both ten times performance improvement and higher reliability radar signal processors.
- (U) Develop an advanced gallium arsenide X-band filter to achieve simultaneous T/R radar capability.
- (U) Develop array-level fabrication techniques using advanced semiconductors for radar and electronic warfare processing technologies.

(U) FY 1994 Planned Program:

- (U) Develop MW/digital components for advanced integrated digital beamforming phased arrays.
- (U) Demonstrate affordable and producible MW module packaging configuration for phased arrays.
- (U) Develop externally-protected integrated circuit package assemblies which reduce electronic component cost.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Hughes, El Segundo, CA; TI, Dallas, TX; Rockwell, Thousand Oaks, CA; GE, Schenectady, NY; and Westinghouse, Baltimore, MD.

(U) Related Activities:

- (U) PE 0603270F, Electronic Combat Technology.
- (U) PE 0603706E, Microwave/Millimeterwave Integrated Circuits.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Budget Activity: #2 - Advanced Technology
Development

2. (U) Project 69DF, Attack Management: Develops and demonstrates integrated fire control technology and techniques to provide pilots with increased precision strike efficiency and reduced hostile fire exposure, including avionics/weapons fire control integration, attack management and decision aids, intra-flight mission management, and cooperative engagement methods to improve combat performance in air-to-air and air-to-ground missions.

(U) FY 1992 Accomplishments:

- (U) Completed assessment of using synthetic aperture radar for precision weapon delivery.
- (U) Performed initial data collection and initiated evaluation of operational payoff of an automatic target cuer (ATC) integrated with a forward looking infrared (FLIR) for air-to-ground targeting.

(U) FY 1993 Planned Program:

- (U) Complete fire control/weapon delivery requirements definition for improved tactical air-to-air missile accuracy/flexibility.
- (U) Demonstrate algorithms for improved situation awareness and weapon flexibility aspects of an active side array radar.
- (U) Complete test and evaluation of integrated ATC and FLIR for air-to-ground targeting.

(U) FY 1994 Planned Program:

- (U) Complete requirements definition, technique development, and evaluation of integrated fire control for air-to-air missiles.
- (U) Develop flight demonstration software for operational test of air-to-ground attack with multiple precision weapon delivery on a single pass.
- (U) Complete active side array radar situation awareness feasibility demonstration.

- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: McDonnell Douglas, St. Louis, MO; Hughes Aircraft Division, Los Angeles, CA; and Westinghouse, Baltimore, MD.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603238F, Air Defense/Precision Strike Technology Demonstration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

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Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Budget Activity: #2 - Advanced Technology
Development

3. (U) Project 1177, Target Recognition: Develops and demonstrates avionics technology and techniques required to achieve positive, high-confidence cueing, recognition, and identification of either airborne or ground-based targets at ranges compatible with tactical air-to-air and air-to-ground weapons, day or night, in adverse-weather, and in high-threat, multiple-target areas.

(U) FY 1992 Accomplishments:

- (U) Ground tested ultra-high range resolution (UHRR) radar mode for non-cooperative target identification of aircraft.
- (U) Collected data for evaluation of automatic target cuers for forward looking infrared (FLIR) air-to-ground targeting.

(U) FY 1993 Planned Program:

- (U) Deliver UHRR synthetic air target signature data base for training airborne threat identification algorithms and demonstration in an operational exercise.
- (U) Design target detection algorithms using model-based vision (MBV) technique for air-to-ground FLIR and laser radar sensors.
- (U) Complete integration of an automatic target cuer algorithm for evaluation in air-to-ground engagements.

(U) FY 1994 Planned Program:

- (U) Complete validation of UHRR radar signature synthesis capability for target identification.
- (U) Demonstrate ground target signature model generation capability and MBV synthetic aperture radar (SAR) target recognition software for use in development and analysis of MBV recognition algorithms.
- (U) Design an automatic target recognizer with an integrated active/passive sensor.

- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Hughes Aircraft, El Segundo, CA; TASC, Reading, MA; TAU Corp., Los Gatos, CA; and Veda Inc., Dayton, OH.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603742F, Non-Cooperative Target Recognition Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2334, Airborne Radar Electronic Counter-Countermeasures:

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Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Budget Activity: #2 - Advanced Technology
Development

Develops and demonstrates electronic counter-countermeasure (ECCM) technology and techniques for current and future airborne weapon system radars that must operate in intense electronic combat environments, with emphasis on methods to reduce radar susceptibilities to enemy electronic countermeasures (ECM).

(U) FY 1992 Accomplishments:

- (U) Roofhouse tested simultaneous transmit and receive strategies.
- (U) Developed active side-mounted array radar for increased fighter aircraft weapon effectiveness.

(U) FY 1993 Planned Program:

- (U) Develop electronic counter-countermeasure (ECCM) techniques to counter terrain-bounce, synthetic aperture radar (SAR), coordinated countermeasures, and anti-radiation missile ECM.
- (U) Complete initial flight test evaluation of ECCM techniques for countering mainbeam blinking jamming.
- (U) Flight test active side-mounted array radar and evaluate potential for augmenting radar and ECCM capability.

(U) FY 1994 Planned Program:

- (U) Flight test radar ECCM techniques that counter anti-radiation missiles.
- (U) Demonstrate adaptive threshold ECCM to counter noise jamming and mainbeam nulling to counter escort jammers.
- (U) Develop wideband shared aperture diplexer technology.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Georgia Technical Research Institute, Atlanta, GA; Raytheon, Tewksbury, MA; and Hughes, Los Angeles, CA.

(U) Related Activities:

- (U) PE 0603204F, Aerospace Avionics.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) Coordinated with Joint Directorate of Laboratories Sensors Panel.
- (U) This project has been coordinated through the Project Reliance Process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2345, Covert Airborne Communications: Develops and demonstrates technologies and techniques to reduce radio emissions to keep communications from causing low-observable airborne platforms detection/location and reduce aircraft physical and electromagnetic vulnerability. Focus is on: low probability of

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Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Budget Activity: #2 - Advanced Technology
Development

detection short and moderate range data links for covert cooperative operations; moderate and high capacity reconnaissance data links for real-time transmission of time-critical information; dual role communications and identification friend-or-foe capabilities for close air support; and short-range aircraft to weapon communications (on-board and post-launch). This project was denied requested funding in FY 1993 by Congress.

(U) FY 1992 Accomplishments:

- (U) Completed development of advanced development model for the airborne imagery transmission program.
- (U) Completed preliminary designs of the low probability of detection intra-flight data link for cooperative covert operations.

(U) FY 1993 Planned Program:

- (U) Not Applicable.

(U) FY 1994 Planned Program:

- (U) Determine feasibility of optical communications and identification friend-or-foe (IFF) capabilities for electro-optical target acquisition.
- (U) Design a low-cost, low probability of detection, jam-resistant, medium capacity (1.544M bits per second), multiple user, reconnaissance/intelligence data exchange capability for secondary dissemination.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors will be competitively determined.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603203F Project Number: 665A
 PE Title: Advanced Avionics Budget Activity: #2 - Advanced Technology
for Aerospace Vehicles Development

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Electro-Optical Targeting Sensors	6,472	15,037	25,588	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Develops and demonstrates electro-optical sensor technologies and techniques needed to achieve precise, real-time combat target acquisition and tracking capability against airborne and ground-based threats, critical combined active and passive sensor technologies and techniques required to increase electro-optical sensor capabilities to detect, locate, and strike fixed and mobile ground targets, and passive infrared (IR) search and track sensor technology to provide covert targeting capability for first shot/first kill air superiority. Increased emphasis began in FY 1993 on development and demonstration of passive IR search and track sensor and window technology which will provide the pilot a passive situation awareness capability that can operate in the supersonic regime. In FY 1994, final design, component fabrication, and test will be accomplished.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed requirements definition and initiated design of an affordable, passive IR sensor, capable of supersonic cruise flight regime, to detect and track airborne targets in look-down mode against earth clutter background.
- (U) Assembled and laboratory tested long-range laser radar testbed critical components.

2. (U) FY 1993 Planned Program:

- (U) Continue design and begin fabrication of IR, supersonic cruise-capable, look-down in clutter, air-to-air targeting sensor.
- (U) Develop and test laser radar technology to enhance attack against time-critical targets.
- (U) Initiate design of an integrated active/passive sensor for missions against time-critical targets.

3. (U) FY 1994 Planned Program:

- (U) Complete fabrication of IR, supersonic cruise-capable, look-down in clutter, air-to-air targeting sensor.
- (U) Complete fabrication of a supersonic cruise capable window.
- (U) Complete design of an integrated active/passive sensor capable of target recognition and precision weapon delivery against ground-based threats.
- (U) Demonstrate a laser radar capable of compensating for the effects of wind on first shot weapon accuracy for gunships.

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Program Element: #0603203F
PE Title: Advanced Avionics
for Aerospace Vehicles

Project Number: 665A
Budget Activity: #2 - Advanced Technology
Development

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Hughes Aircraft, El Segundo, CA; and Martin Marietta, Orlando, FL.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: The advanced infrared search and track program was delayed three months for a protest by the losing bidder which was dismissed in February 1993.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Air Combat Command Avionics Technology Requirements Letter, October 1991.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0603270F, Electronic Warfare Technology.
- (U) Coordinated with Joint Directorate of Laboratories Sensors Panel.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|---|----------------|
| 1. (U) Complete infrared sensor concept | June 1993 |
| 2. (U) Laboratory test targeting laser radar | August 1993 |
| 3. (U) Test infrared window coupon | August 1993 |
| 4. (U) Complete ballistics wind compensator design | September 1993 |
| 5. (U) Complete infrared sensor design | December 1993 |
| 6. (U) Complete active/passive sensor concept | March 1994 |
| 7. (U) Laboratory test infrared sensor | June 1994 |
| 8. (U) Complete active/passive sensor design | March 1995 |
| 9. (U) Wind tunnel infrared sensor test | January 1996 |
| 10. (U) Gunship ballistics wind compensator live fire demonstration | April 1996 |
| 11. (U) Infrared sensor flight test evaluation | December 1996 |
| 12. (U) Complete active/passive sensor evaluation | August 1997 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603205E
PE Title: Aerospace Vehicle Technology

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2506 Control of Flight	5,092	4,497	3,067	Cont	TBD
2508 Aeromechanics/Vehicle Subsystems	4,932	2,331	1,258	Cont	TBD
2978 Reliability and Maintainability	1,873	3,492	4,746	Cont	TBD
3422 Cockpit Technology	<u>1,325</u>	<u>4,953</u>	<u>4,043</u>	<u>Cont</u>	<u>TBD</u>
Total	13,222	15,273	13,114	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and validates vehicle subsystems, flight control, cockpit, and aerodynamic technologies. Develops lower cost component technologies that will improve aircraft reliability and maintainability (R&M), performance, and survivability of existing systems. These air vehicle technology programs provide the core investment in DoD and dual-role technologies that produce air superiority and affordability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2506, Control of Flight: Develops flight control technologies, including integration of flight/propulsion control and vehicle management system technologies, for improved total aircraft efficiency, performance, and maneuverability. Develops electrically powered control surface actuator and brake systems to eliminate centralized hydraulic systems and associated maintenance/safety problems. Develops "smart" actuators that utilize embedded sensors and computer actuation to enhance performance (e.g., compensate for battle damage). Develops integration technologies to reduce the number of individual control and subsystems boxes in an aircraft by combining electrical, cooling, hydraulic, oxygen-generating, and other utility functions.

(U) FY 1992 Accomplishments:

- (U) Completed "smart" actuator ground test plan.
- (U) Developed concepts for integrated vehicle subsystem design and control functions to significantly improve reliability.
- (U) Developed design for advanced electric actuators.

(U) FY 1993 Planned Program:

- (U) Complete flight tests of "smart", computer-aided electrohydrostatic actuators.
- (U) Complete integrated utility design for an integrated aircraft-mounted accessory drive, auxiliary power unit, and air cycle machine.
- (U) Develop designs for advanced electric brake system.

(U) FY 1994 Planned Program:

- (U) Complete quantification of payoffs for integrated utility design.
- (U) Complete flight test of electromechanical actuator.
- (U) Evaluate designs for advanced electric brake system.

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Program Element: #0603205F
PE Title: Aerospace Vehicle Technology

Budget Activity: #2 - Advanced Technology Development

- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The top two contractors are: McDonnell Douglas Aircraft Co., St. Louis, MO; and General Dynamics (Lockheed), Ft. Worth, TX.
- (U) Related Activities:
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0603216F, Aerospace Propulsion and Power.
 - (U) PE 0603245F, Advanced Flight Technology Integration.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 2508. Aeromechanics/Vehicle Subsystems: Develops aerodynamic technology and subsystems for improved aircraft maneuverability, agility, reliability, and performance at a lower cost. Develops and demonstrates aerodynamic technologies for safe high angle-of-attack (AOA) operation. Develops aerodynamic/propulsion control devices for improved air vehicle flight maneuvers and reduced/eliminated fighter aircraft vertical tails. Develops low-drag/low-observable, external weapon carriage concepts for incorporating air-to-surface weapons on fighter aircraft. Develops advanced environmental control system concepts for cockpit/avionics cooling and increased range by reducing the engine bleed air requirement. Develops and integrates aeromechanical crew escape technologies for full mission crew escape capability.
 - (U) FY 1992 Accomplishments:
 - (U) Completed wind tunnel and initial screening observability tests for low-drag/low-observable weapons carriage.
 - (U) Completed the ground demonstration of an axisymmetric vectoring nozzle for primary aircraft control.
 - (U) Fabricated advanced cooling system heat exchanger and digital control.
 - (U) FY 1993 Planned Program:
 - (U) Develop and test an innovative aero control device for full-scale ground testing on a fighter aircraft.
 - (U) Demonstrate 10% fuel savings advantage of an advanced cooling system in a simulated fighter environment.
 - (U) Develop flight controls and integrate with Navy thrust vectoring rocket propulsion subsystem for an advanced crew escape system.
 - (U) FY 1994 Planned Program:
 - (U) Demonstrate integrated flight controls and thrust vectoring subsystems in sled tests for an advanced crew escape system.
- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The top four contractors are: Boeing Corp., Seattle, WA; McDonnell Douglas Aircraft Co., St. Louis, MO; Grumman Aerospace Corp., Bethpage, NY; and Canadian Commercial Corp., Ontario, Canada.
- (U) Related Activities:
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0602602F, Conventional Weapons Technology.
 - (U) PE 0603231F, Crew Systems and Personnel Protection Technology.

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Program Element: #0603205F
PE Title: Aerospace Vehicle Technology

Budget Activity: #2 - Advanced Technology Development

- (U) PE 0603245F, Advanced Flight Technology Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 2978, Reliability and Maintainability: Designs and develops air vehicle technologies for improved reliability, maintainability, and supportability while increasing performance, survivability, and mission effectiveness. Develops software modules to extend validation and verification of critical flight control software. Develops tire analysis, design, and testing technology to significantly improve tire life, thus, lowering life cycle costs for existing and future aircraft. Develops design and assessment concepts to reduce the high failure rate of electromechanical aircraft subsystems. Develops and updates a knowledge-based engineering model that will be used to predict life cycle elements for the design of aircraft and subsystems.
 - (U) FY 1992 Accomplishments:
 - (U) Completed definition of tire/wheel/landing gear compatibility issues for fighter aircraft radial tire applications.
 - (U) Transitioned a wiring maintenance aid providing a battle damage repair time savings of up to 100 hours.
 - (U) Developed a two-dimensional finite-element model for a fighter aircraft main tire/wheel interface.
 - (U) FY 1993 Planned Program:
 - (U) Complete verification of the analytical/experimental approach for the fighter aircraft tire/wheel interface model.
 - (U) Define critical flight control system software validation and verification requirements.
 - (U) Identify life cycle conditions experienced by aircraft and related systems (i.e., externally-carried weapons).
 - (U) FY 1994 Planned Program:
 - (U) Complete fighter aircraft radial tire compatibility evaluation.
 - (U) Complete Ada software flight control modules for simplified validation and verification.
 - (U) Develop expert knowledge-based interactive database for life cycle conditions experienced by externally-carried weapons.
- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The top two contractors are: Hughes Aircraft Co., Los Angeles, CA; and Honeywell Corp., Minneapolis, MN.
- (U) Related Activities:
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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Program Element: #0603205E
PE Title: Aerospace Vehicle Technology

Budget Activity: #2 - Advanced Technology Development

4. (U) Project 3422, Cockpit Technology: Develops and assesses cockpit advanced development concepts. Integrates flat panel displays with graphic processors, applies heads-up and helmet-mounted displays where appropriate, and standardizes display symbology. Applies artificial intelligence technology, three-dimensional audio, voice command, and other cockpit technologies to facilitate attack of fixed and mobile targets at night and in adverse-weather. Develops methods for presenting shared, real-time intelligence information. Develops and assesses advanced cockpit technologies for tactical transport aircraft. Improves situational awareness and crew member productivity during night/adverse-weather, low-level operations. Products from this project will be integrated in PE 0603245F to validate measures of mission performance and effectiveness of the crew system technologies.

(U) FY 1992 Accomplishments:

- (U) Analyzed and modified display size/symbology set proposed for cargo aircraft cockpit retrofit.
- (U) Defined and identified cargo aircraft primary flight display symbology needs.

(U) FY 1993 Planned Program:

- (U) Define transport and tactical aircraft cockpit mission design concepts.
- (U) Define air-to-surface weapon delivery display and aircraft cockpit design concepts.
- (U) Define techniques for using and integrating voice control of pilot functions.
- (U) Complete configuration analysis and begin cockpit designs for a fighter cockpit capable of rapidly utilizing off-board information for in-flight mission replanning.

(U) FY 1994 Planned Program:

- (U) Refine and validate methods for cockpit integration of real-time intelligence data.
- (U) Develop and analyze perspective displays for previewing target attack plan.
- (U) Define transport cockpit/display system design.
- (U) Complete design and begin part task simulator evaluation of fighter cockpit design concepts utilizing off-board information for in-flight mission replanning.

- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH, which also conducts the in-house projects described. The prime contractors are: McDonnell Douglas Co., St. Louis, MO.; and General Dynamics (Lockheed), Ft. Worth, TX.

(U) Related Activities:

- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0603707E, Prototyping (Pilot's Associate Program).
- (U) PE 0603245F, Advanced Flight Technology Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603211F
PE Title: Aerospace Structures

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
69CW Advanced Composites	7,984	8,210	6,447	Cont	TBD
486U Advanced Metallics					
	<u>6,452</u>	<u>7,697</u>	<u>6,194</u>	<u>Cont</u>	<u>TBD</u>
Total	14,436	15,907	12,641	Cont	TBD

- B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program in aircraft structures develops both metals and composites technologies to reduce the cost of airframe ownership through innovative structural concepts established through concurrent engineering and integrated product development approaches. This program demonstrates advanced structural design concepts using nonmetallic (Project 69CW) and metallic (Project 486U) structures. Innovative structural concepts integrate these two types of materials with new design, manufacturing, and test techniques. The goal of this program element is to transition these technology benefits to all types of flight vehicle structures, ranging from airframes to canopies to engines. The results are lighter, stronger, less maintenance intensive, more durable structures for current and future aerospace systems. This yields lower cost of ownership (by reducing acquisition, support, and maintenance costs), increased range (less structural weight means more fuel can be carried), improved sortie rates (due to durability and damage/threat tolerance and design for supportability), and reduced observability (both radar cross section and infrared).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 69CW, Advanced Composites: Develops and demonstrates advanced nonmetallic structures technology using fiber reinforced thermoset, thermoplastic, carbon-carbon, and ceramic materials. These technologies will provide enhanced survivability (reduced radar and infrared signature, increased damage tolerance), reduced weight, reduced acquisition and life cycle costs, and increased mission readiness for weapon systems.

(U) FY 1992 Accomplishments:

- (U) Completed the fabrication of an advanced wing skin, spar and box, for the carbon-carbon primary structure program.
- (U) Completed the fabrication of a full-scale composite fighter inlet duct.
- (U) Fabricated a composite fighter tail structure for laser testing.
- (U) Completed design of a low-cost composite transport wing.
- (U) Completed initial development of "smart" structure/skins (i.e., using embedded fiber-optic-based sensors for damage detection).

(U) FY 1993 Planned Program:

- (U) Conduct turbine engine tests on ceramic composite two-dimensional nozzle sidewall full-scale components.
- (U) Fabricate and assemble the mission integrated transparency system demonstrator F-16 canopy for maintenance testing.

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Program Element: #0603211F
PE Title: Aerospace Structures

Budget Activity: #2 - Advanced Technology Development

- (U) Complete radar cross section and structural tests of a full-scale composite fighter advanced inlet duct and wing leading edge.
- (U) FY 1994 Planned Program:
 - (U) Complete test and demonstration of a high-temperature, low-observable missile empennage.
 - (U) Complete design and initiate test article fabrication of "smart" composite structures (i.e., wing skin, wing spar, and/or wing torque box dependent upon contract award).
 - (U) Complete testing of a transparency structural frame to improve canopy service life.
- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH. The major contractors include: Lockheed Aeronautical Systems Co., Marietta, GA; Northrop Corp., Hawthorne, CA; General Dynamics (Lockheed), Ft. Worth, TX; Boeing Aerospace Co., Kent, WA; Pratt and Whitney, West Palm Beach, FL; McDonnell Douglas Co., St. Louis, MO; and General Electric Co., Evandale, OH.
- (U) Related Activities:
 - (U) PE 0602102F, Materials.
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0603112F, Advanced Materials for Weapon Systems.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 486U, Advanced Metallics: This project develops and demonstrates new metallic structures technology using metal matrix composites (MMC), rapidly solidified metal powders, advanced aluminum and titanium alloys, and advanced damping materials. These are used to develop innovative design concepts which could transition to fielded and future military and civilian flight vehicle structures to yield lower weight, greater reliability, improved survivability (ballistic/laser damage, birdstrikes, etc.), and affordability.
 - (U) FY 1992 Accomplishments:
 - (U) Analyzed aircraft high energy laser survivability.
 - (U) Completed fabrication of hybrid metallic/composite fuselage fighter structure.
 - (U) Completed initial fabrication of a full-scale elevated temperature aluminum keel beam aft fuselage structural aircraft component.
 - (U) Completed preliminary design of a structural wing spar for an aircraft retrofit and upgrade.
 - (U) FY 1993 Planned Program:
 - (U) Conduct ground test and evaluation of a hybrid metallic/composite fuselage structural component.
 - (U) Conduct ground test and evaluation of a full-scale elevated temperature aluminum structural component (i.e., an aft fuselage keel beam).
 - (U) Enhance methodology to analyze aircraft materials and structures exposed to high-energy lasers.

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Program Element: #0603211E
PE Title: Aerospace Structures

Budget Activity: #2 - Advanced Technology Development

- (U) Complete redesign and begin fabrication of an advanced metallic wing spar to demonstrate the ability to extend the life of aging aircraft.
- (U) FY 1994 Planned Program:
 - (U) Complete fabrication and begin test of an advanced metallic wing spar to extend the operational life of aging aircraft.
 - (U) Complete verification of laser vulnerability modeling techniques through full-scale aircraft structure tests.
 - (U) Complete ground test of an elevated temperature aluminum structure (i.e., an aft fuselage keel beam).
 - (U) Complete detailed designs of exhaust impinging structures exposed to high temperature and severe acoustic environment.
- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH. The major contractors include: Lockheed Aeronautical Systems Co., Marietta, GA; Northrop Aircraft Co., Hawthorne, CA; General Dynamics (Lockheed), Ft. Worth, TX; Science Applications International Corp., Dayton, OH; McDonnell Aircraft Co., St. Louis, MO; and Rockwell International, El Segundo, CA.
- (U) Related Activities:
 - (U) PE 0602102F, Materials.
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0603112F, Advanced Materials for Weapon Systems.
 - (U) Tri-Service Metal Matrix Composite (MMC) Steering Group.
 - (U) Tri-Service Laser Hardened Materials and Structures Steering Group.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603216F

Budget Activity: #2 - Advanced

PE Title: Aerospace Propulsion
and Power Technology

Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2480 Aerospace Fuels Technology	897	925	1,635	Cont	TBD
2697 Atmospheric Propulsion Concepts	8,687	6,426	2,438	Cont	TBD
3035 Aerospace Power Technology	2,046	2,621	2,330	Cont	TBD
3036 Battery Technology	903	639	495	Cont	TBD
681B Advanced Turbine Engine Gas Generator (ATEGG)	<u>23,360</u>	<u>27,537</u>	<u>29,716</u>	<u>Cont</u>	<u>TBD</u>
TOTAL	35,893	38,148	36,614	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program element ensures continuous development and demonstration of affordable turbine engine high pressure core components, advanced airbreathing engine concepts, high heat sink and thermally stable fuels, and battery and power technology for aerospace vehicles. Anticipated technology advances include: turbine engine improvements providing a 33% reduction in aircraft takeoff gross weight for tactical fighter aircraft, or a 33% reduction in missile fuel consumption, or a 100% increase in aircraft range/loiter; ducted rocket improvements that increase missile average and terminal velocity by 50% for enhanced lethality; higher temperature fuels for propulsion and thermal management; an aircraft battery with a 20-year maintenance-free life expectancy; and electric aircraft power components projected to have a two- to five-fold improvement in reliability and maintainability, a 20% reduction in power system weight, and enhanced survivability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2480, Aerospace Fuels Technology: Demonstrates new thermally stable (JP) and endothermic fuels and fuel system components that minimize cost, reduce maintenance, and improve performance of aircraft and missile engines. Conventional petroleum and alternate fuels are demonstrated for both aircraft and missiles. Emphasis is on demonstrating thermally stable fuels that will reduce fuel system maintenance problems in current aircraft and provide 50% more cooling capability for upgraded weapon systems with very little increase in fuel cost. Endothermic fuel heat exchangers/reactors will be demonstrated to provide maximum cooling capability for aircraft avionics and infrared signature reduction.

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Program Element: #0603216F
PE Title: Aerospace Propulsion
and Power Technology

Budget Activity: #2 - Advanced
Technology Development

(U) FY 1992 Accomplishments:

- (U) Validated the lightweight missile endothermic fuel reactor.
- (U) Completed design of advanced endothermic fuel wall-cooled combustor/nozzle.
- (U) Completed design of large-capacity, reusable heat exchanger/reactor for man-rated applications.

(U) FY 1993 Planned Program:

- (U) Validate endothermic fuel wall-cooled combustor/nozzle reactor sector which will provide 15 times more cooling capability.
- (U) Develop a test plan and conduct laboratory testing to demonstrate a high temperature fuel additive to JP-8 (JP-8+100).

(U) FY 1994 Planned Program:

- (U) Determine if JP-8+100 reduces fuel injector fouling.
- (U) Fabricate nozzle actuator simulator for JP-8+100 demonstration.
- (U) Retrofit in-house, reduced scale fuel system simulator test rig to model a complete turbine engine system for JP-8+100 performance testing.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractor is Pratt and Whitney, West Palm Beach, FL.

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriated Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2697, Atmospheric Propulsion Concepts: Provides assessment and demonstration of unconventional airbreathing propulsion subsystems such as ramjets, air turborockets, and combined cycle engines to assure future propulsion options for high speed missiles. Currently, the Variable Flow Ducted Rocket (VFDR) concept is being developed as an improved propulsion system for current missile upgrades or future missile system developments.

(U) FY 1992 Accomplishments:

- (U) Established VFDR gas generator and booster final design.
- (U) Completed VFDR booster and gas generator testing at simulated flight conditions.
- (U) Fabricated and tested flight weight VFDR technology development engines.

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Program Element: #0603216F

Budget Activity: #2 - Advanced

PE Title: Aerospace Propulsion
and Power Technology

Technology Development

(U) FY 1993 Planned Program:

- (U) Select Variable Flow Ducted Rocket (VFDR) booster propellant and continue booster design updates.
- (U) Conduct ground-based performance verification testing of VFDR engine technologies.
- (U) Conduct VFDR ground-based transition tests demonstrating boost-to-sustained ramjet operation at Mach 2.

(U) FY 1994 Planned Program:

- (U) Conduct final VFDR review, freeze engine design, and manufacture engines for final testing.
- (U) Complete VFDR integrated engine ground tests.
- (U) Initiate planning for combined cycle engine design and demonstration.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The two contractors are: Atlantic Research Corporation, Gainesville, VA; and Hercules Inc., McGregor, TX.

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3035, Aircraft Power Technology: Develops and demonstrates aircraft power systems such as hydraulics, engine starters, auxiliary power units, and electrical power distribution systems. The principal focus is the More-Electric Aircraft (MEA) initiative providing a two- to five-fold improvement in reliability and maintainability, a 20% weight reduction, and reduced cost of ownership for aircraft power systems. This will be accomplished by replacing fluid-powered (hydraulics/bleed air) accessories with electrically-powered systems. Representative improvements quantified for MEA include: increased reliability (8-18%); improved maintainability (9-12%); and reduced vulnerability (12-14%).

(U) FY 1992 Accomplishments:

- (U) Completed engine starter performance testing from -65°F to 130°F to demonstrate simulated starts without refurbishment.
- (U) Completed the preliminary design of the MEA power distribution subsystem.
- (U) Completed detailed design of external integral starter/generator.

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Program Element: #0603216F

Budget Activity: #2 - Advanced

PE Title: Aerospace Propulsion
and Power Technology

Technology Development

(U) FY 1993 Planned Program:

- (U) Fabricate More-Electric Aircraft (MEA) power distribution components.
- (U) Verify built-in-test, fault sensing and isolation, and load management functions of the electrical power system.
- (U) Conduct component and system tests of external integral starter/generator (IS/G) concept.
- (U) Complete rig testing of first generation high reliability generator, using fast-acting power switches, to demonstrate a 50% increased power output with double the reliability.

(U) FY 1994 Planned Program:

- (U) Complete performance testing of all MEA power system components.
- (U) Initiate construction of MEA power system demonstrator.
- (U) Complete component and system testing of the external IS/G.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: General Dynamics Co., Fort Worth, TX; General Electric, Schenectady, NY, and Evendale, OH; and Northrop Corporation, Hawthorne, CA.

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3036, Battery Technology: Develops and demonstrates advanced battery technology for aircraft and missiles to provide higher energy density (more energy per volume) with improved life. A major focus is the development of a nickel-cadmium aircraft battery with a 20-year maintenance-free life expectancy. Current nickel-cadmium aircraft batteries require scheduled maintenance every 30-90 days. This "maintenance-free" technology will eliminate the need for flight line battery shops and overall Air Force fleet savings could approach one billion dollars for a 20-year time period from decreased life cycle and maintenance costs.

(U) FY 1992 Accomplishments:

- (U) Designed and developed maintenance-free battery (MFB) cells with new, lower cost sealing techniques.
- (U) Characterized the charging regime to optimize the required long life of the MFB cell.

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Program Element: #0603216F

Budget Activity: #2 - Advanced

PE Title: Aerospace Propulsion
and Power Technology

Technology Development

- (U) Designed and developed the microprocessor and power components for the "smart" charger on the maintenance-free battery (MFB).
- (U) FY 1993 Planned Program:
 - (U) Fabricate and test flight-quality, sealed nickel-cadmium battery and charger for the MFB program.
- (U) FY 1994 Planned Program:
 - (U) Complete performance testing and transition battery system technology to user.
 - (U) Complete MFB program.
- (U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: Eagle-Picher, Joplin, MO; and Eldec, Lynnwood, WA.
- (U) Related Activities:
 - (U) PE 0602203F, Aerospace Propulsion.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603216F Project Number: 681B
PE Title: Aerospace Propulsion Budget Activity: #2 - Advanced
and Power Technology Technology Development

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Advanced Turbine Engine Gas Generator (ATEGG)	23,360	27,537	29,716	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops turbine engine gas generator technology to meet the requirements of current and future aircraft propulsion systems. The objective is to provide the continued evolution of technologies into an advanced gas generator in which the performance, cost, durability, repairability, and maintainability aspects can be assessed in a real engine environment. The gas generator, or core, is the basic building block of the engine and it consists of a compressor, a combustor, and a high pressure turbine. Experimental core engine testing enhances early, low-risk transition of key engine technologies into engineering development where they can be applied to derivative and/or new systems. These technologies are applicable to a wide range of military and commercial systems including aircraft, missiles, land combat vehicles, and ships. This project supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative which is a totally integrated DOD, DARPA, NASA, and industry effort focused on doubling turbine engine propulsion capabilities while reducing acquisition and ownership costs. The IHPTET program structure provides intermediate technology transition for turbine engine upgrades and derivatives while enhancing the U.S. turbine engine industry's international competitiveness.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Tested a turboprop demonstrator engine core with a 19% reduction in specific fuel consumption and a 33% improvement in power-to-weight.
- (U) Tested a transpiration cooled combustor and turbine in a turbofan demonstrator core at +325°F over today's capability. Transitioned this technology to F110 Component Improvement Program.
- (U) Tested the first ever metal matrix composite compressor in a turbofan demonstrator engine core yielding 25% improvement in work per stage and a 10% reduction in rotor weight.
- (U) Fabricated a high work turbine with a 600°F increase in rotor inlet temperature.
- (U) Transitioned turbine brush seal technology.

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Program Element: #0603216F
PE Title: Aerospace Propulsion
and Power Technology

Project Number: 681B
Budget Activity: #2 - Advanced
Technology Development

2. (U) FY 1993 Planned Program:

- (U) Complete performance demonstration of a turbofan/turbojet core with an overall 30% increase in thrust-to-weight, 23% reduction in fuel consumption, and 10% reduction in life cycle cost. Technologies include a metal matrix composite (MMC) compressor rotor, brush seals in the turbine and compressor, super cooling technology in the turbine, and the first ever magnetic bearing.
- (U) Conduct turboprop demonstrator engine core testing demonstrating a 20% reduction in specific fuel consumption and a 40% power-to-weight improvement.
- (U) Engine test a MMC compressor rotor and transpiration cooled combustor and turbine at a temperature 600°F over today's capability (ten-fold life improvement at today's temperatures).

3. (U) FY 1994 Planned Program:

- (U) Engine test an axial staged combustor that improves cooling airflow by 70%, reduces length by 20%, and improves emissions.
- (U) Engine test a +300°F MMC compressor rotor providing a 20% reduction in weight and reduced parts count for improved reliability.
- (U) Conduct next generation turboprop demonstrator engine core testing with a 25% reduction in specific fuel consumption and a 60% increase in power-to-weight ratio. Technologies include swept aerodynamic compressor, bonded single crystal turbine blades, ceramic combustor, and ceramic ball bearings.
- (U) Initiate the design of affordable turbofan/turbojet core engines utilizing such advanced technology as all MMC compressor rotors, ceramic combustor liners, and composite reinforced turbine disks. The goal is to reduce engine fuel consumption by 30%, increase thrust-to-weight ratio by 60%, reduce engine life cycle cost by 20%, and decrease engine acquisition cost per pound of thrust by 30%.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: General Electric, Evendale, OH; Pratt and Whitney, West Palm Beach, FL; Garrett Engine Division, Phoenix, AZ; Allison Gas Turbine Division, Indianapolis, IN; and Textron Lycoming, Stratford, CT.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Turboprop design effort restored in FY 1995.
2. (U) SCHEDULE CHANGES: Affordable turbofan/jet effort restored in FY 1994.
3. (U) COST CHANGES: None.

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Program Element: #0603216F
PE Title: Aerospace Propulsion
and Power Technology

Project Number: 681B
Budget Activity: #2 - Advanced
Technology Development

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE 0602122N, Aircraft Technology.
- (U) PE 0603210N, Aircraft Propulsion.
- (U) PE 0603003A, Aviation Advanced Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|--|----------|
| 1. (U) Complete testing of current generation turbofan core (+30% thrust-to-weight, -23% fuel consumption) | Mar 1993 |
| 2. (U) Complete testing of current generation turboprop core (+40% power-to-weight, -20% fuel consumption) | Mar 1993 |
| 3. (U) Conduct testing of next generation turbofan core with +600°F or ten-fold life improvement for hot section | Jul 1993 |
| 4. (U) Initiate testing of next generation turboprop core | Nov 1993 |
| 5. (U) Conduct testing of next generation turbofan core with low emissions combustor and high work turbine | May 1994 |
| 6. (U) Complete testing of next generation turboprop core (+60% power-to-weight, -25% fuel consumption) | Sep 1994 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603227F Budget Activity: #2 - Advanced Technology
PE Title: Personnel, Training, Development
and Simulation Technology

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2743 Tactical Aircrew Training Technology	4,484	5,097	5,373	Cont	TBD
2922 Manpower and Force Management	1,123	1,336	1,488	Cont	TBD
2949 Advanced Training Technology	<u>2,270</u>	<u>2,535</u>	<u>1,957</u>	<u>Cont</u>	<u>TBD</u>
Total	7,877	8,968	8,818	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates improved operational readiness and combat training through Manpower, Personnel, and Training (MPT) technologies which include: systems to write computer-based training programs; decision-aiding systems to optimize personnel use; job performance measurement technologies; analytical tools to better consider MPT in system design; and realistic aircrew combat training.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2743, Tactical Aircrew Training Technology: This project develops, demonstrates, and evaluates simulator-based air combat training as an affordable, effective, and realistic adjunct to flight-based training. Provides a testbed for examining aircrew skills, cognitive functions, behaviors, and instructional strategies contributing to combat success. Simulators of various fidelities are used to assess training activities such as ground-based night vision practice to find the most cost-effective technologies for combat training. Technologies for long-distance computer networking will enhance current methods for joint-Service training.

(U) FY 1992 Accomplishments:

- (U) Demonstrated low-cost color liquid crystal helmet-mounted display technology for squadron-level training.
- (U) Demonstrated networked combat engagement trainers for low-cost, high-fidelity air-to-air training.
- (U) Demonstrated long-distance distributed air-to-air network for realistic force-on-force air combat simulation.

(U) FY 1993 Planned Program:

- (U) Demonstrate fully integrated multi-ship training simulator.
- (U) Draft a visual training effectiveness handbook.
- (U) Develop and demonstrate technologies to support a networked simulation of hunting and killing mobile missile launchers.

(U) FY 1994 Planned Program:

- (U) Demonstrate a long-distance simulation network between Army, Navy, and Air Force locations.
- (U) Demonstrate rapid database generation for 24-hour real world mission rehearsal.

(U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The major contractors are: University of Dayton, Dayton, OH; McDonnell Douglas, St. Louis, MO; General Electric Corporation, Daytona Beach, FL; and LORAL, Orlando, FL.

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Program Element: #0603227F
PE Title: Personnel, Training,
and Simulation Technology

Budget Activity: #2 - Advanced Technology
Development

(U) Related Activities:

- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0604227F, Flight Simulator Development.
- (U) The Air Force has formal agreements with the Army for visual display and computer image generation technology.
- (U) The Navy has a liaison office at Armstrong Laboratory.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2922, Manpower and Force Management: This manpower, personnel, and training (MPT) project develops technology to understand and consider MPT factors early in weapon systems design and acquisition to ensure the factors are supportable, and to enable trade offs to accommodate MPT limitations and costs. Timely consideration of these factors will reduce weapon systems development and life cycle costs. Advanced technologies will be developed to collect and analyze MPT information and develop personnel assessment technologies for improved manpower and force management.

(U) FY 1992 Accomplishments:

- (U) Developed effectiveness measures for MPT tools and techniques.
- (U) Conducted analysis of Army MPT tools for integration in Air Force work for acquisition or modification of systems at the lowest MPT life cycle costs.
- (U) Linked MPT databases to integrate information from different sources needed to make decisions on force management.

(U) FY 1993 Planned Program:

- (U) Transition procedures for collecting job knowledge requirements to training planners.
- (U) Develop automated survey and analysis technology to improve cost-effectiveness of collecting occupational data.

(U) FY 1994 Planned Program:

- (U) Develop initial MPT technologies to build cost estimations for baseline weapon systems.
- (U) Demonstrate automated job survey and analysis technology to reduce time and cost of conducting occupational surveys on Air Force personnel.

(U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The major contractors are: Operational Technology Corp., San Antonio, TX; Metrica Inc., Bryan, TX; University Energy Systems, Dayton, OH; and Dynamics Research Corp., Wilmington, MA.

(U) Related Activities:

- (U) PE 06022205F, Personnel, Training, and Simulation.
- (U) PE 0604243F, Manpower, Personnel, and Training Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: #0603227F Budget Activity: #2 - Advanced Technology
PE Title: Personnel, Training, Development
and Simulation Technology

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2949, Advanced Training Technology: This project develops and demonstrates: computer-based intelligent tutoring technology for adaptive expertise across tasks in high-technology jobs; and software enabling Air Force training developers to rapidly and cheaply build intelligent computer-assisted training systems which continually interact with students for effective individualized training.

(U) FY 1992 Accomplishments:

- (U) Completed personal computer version of F-15 avionics tutor.
- (U) Completed microcomputer-based authoring shell, a microcomputer intelligence technical training writer.
- (U) Established intelligent computer-assisted training technology testbed at Air Training Command, Air Force Space Command, and Mare Island Navy Shipyard.

(U) FY 1993 Planned Program:

- (U) Demonstrate avionics job family tutor technology to train skills needed across related jobs.
- (U) Complete second generation rapid intelligent tutoring technology.
- (U) Transition F-15 avionics tutor and the intelligent technical training authoring shell.
- (U) Complete first user-built intelligent tutor using the intelligent technical training authoring shell, showing intelligent tutors can be built up to 95% cheaper and in one-fifth the time required without authoring shells.

(U) FY 1994 Planned Program:

- (U) Transition F-15 hydraulics tutor.
- (U) Develop guidelines for authoring of intelligent tutors designed to train personnel in complex skills.
- (U) Demonstrate F-15 mechanical job family tutor.
- (U) Using intelligent tutor authoring technology, demonstrate building tutors at testbed sites to show that instructional developers can use technology without computer programming support.

(U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The major contractors are: University of Pittsburgh, Learning R&D Center, Pittsburgh, PA; and University of Southern California, Los Angeles, CA.

(U) Related Activities:

- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0604243F, Manpower, Personnel, and Training Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603231F Budget Activity: #2 - Advanced Technology
 PE Title: Crew Systems and Personnel Protection Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2722 Aerospace Chemical, Biological, and Directed Energy Defense	3,162	3,841	2,706	Cont	TBD
2829 Crew-Centered Cockpit Design	3,727	4,152	2,342	Cont	TBD
2830 Advanced Life Support	1,421	2,865	1,038	Cont	TBD
2868 Crew Escape	2,445	2,589	2,209	Cont	TBD
3257 Helmet-Mounted Devices Technology	4,323	4,462	2,165	Cont	TBD
Total	15,078	17,909	10,460	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops and demonstrates technologies to protect and enhance the performance of Air Force personnel in operational environments. Specific projects advance and integrate human factors technologies into cockpit, life support, and aircrew equipment designs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2722, Aerospace Chemical, Biological, and Directed Energy Defense: This project develops technology to protect Air Force members performing duty in chemical/biological warfare (CBW) situations, and in directed energy environments. The goal is to maintain sortie generation rates and effectively treat casualties in any type of combat environment. The technology is expressed primarily in computer models that predict effects on fighting forces from CBW attack, directed energy, blast, non-battle injuries, and combat stress; and quantifies replacement needs for medical personnel and equipment to sustain a given level of combat capability. The effects are predicted using simulated attacks upon Air Force personnel dispersed in such airbase facilities as semi-hardened squadron operations facilities, collective protection for medical treatment, aircraft shelters, and flight lines and runways.

(U) FY 1992 Accomplishments:

- (U) Developed Threat Related Attrition (THREAT) computer models incorporating air-to-surface missiles to predict injuries on an airbase from: fuel/air explosives; disease and non-battle injury; and combat stress to assess impacts of various attack scenarios against different types of targets.
- (U) Developed model of wartime medical needs (WAR-MED) to estimate the number of medical personnel needed to support combatants for sustaining given levels of sortie rates following air base attack.

(U) FY 1993 Planned Program:

- (U) Develop THREAT models to predict numbers of medical personnel casualties due to ground attacks.
- (U) Develop THREAT model for predicting personnel attrition and casualties (killed, injured, and slightly wounded) to help planning for personnel replacements and the type and amount of required medical resources.

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Program Element: #0603231F
PE Title: Crew Systems and Personnel
Protection Technology

Budget Activity: #2 - Advanced Technology
Development

(U) FY 1994 Planned Program:

- (U) Incorporate study on human response to crushing injuries into Threat Related Attrition facility models.
- (U) Complete design of the wartime medical needs (WAR-MED) planning system to help refine needs for medical resources at the theater level.
- (U) Develop procedures for avoiding chemical/biological warfare agent contamination of aircraft interiors while loading cargo aircraft in contaminated areas.

(U) Work Performed By: This project is managed by the Human Systems Center, Brooks AFB, TX. The major contractor is BDM International, McLean, VA.

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604703F, Aeromedical/Chemical Defense Systems Development.
- (U) PE 0604601F, Chemical Defense Equipment.
- (U) The Army is DOD lead for chemical warfare defense.
- (U) Medical chemical defense research coordinated with Armed Services Biomedical Research Evaluation and Management Committee, and Joint R&D Acquisition Plan for Chemical Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2829, Crew-Centered Cockpit Design: This project develops cockpit design technologies that are focused on aircrew capabilities. Based on system engineering and human factors principles, the project demonstrates a rigorous and traceable way to develop and test the cockpit based on mission requirements and aircrew capabilities. Products are crew-centered cockpit design processes (activities, rules, and procedures for human system integration) and a flight test engineer's custom workstation for cockpit evaluation. A self-contained and fully integrated network supports crew system engineering from start to finish. It includes an integrated technology for cockpit analysis, computer-aided design for cockpit layout, database management tools for engineering data, and a real-time cockpit simulator that is configurable for cockpit ground test and evaluation. The workstation for flight test features technology for planning, executing, analyzing, and reporting cockpit flight test evaluations. These technologies permit design of the cockpit, with crew capabilities as the central focus, to maximize the aircrew's ability to fly, fight, and win.

(U) FY 1992 Accomplishments:

- (U) Continued validation program for the crew-centered cockpit process and design support system.
- (U) Developed a system specification for technology to support engineers and aircrews in the flight test evaluation of aircraft cockpits.
- (U) Developed architecture for engineering design simulation technology.

(U) FY 1993 Planned Program:

- (U) Demonstrate human-centered cockpit design procedures and software support modules and models for an F-16 reconnaissance feasibility study.

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Program Element: #0603231F

Budget Activity: #2 - Advanced Technology

PE Title: Crew Systems and Personnel
Protection Technology

Development

- (U) Develop computer support technology to aid flight test engineers and aircrews in the quantitative evaluation of aircraft cockpit design in terms of mission success, aircrew performance, and safety.
- (U) FY 1994 Planned Program:
 - (U) Demonstrate human-centered cockpit design procedures and software and support for cockpit modifications in transport and strategic aircraft.
 - (U) Field test computer support technology to aid flight test centers in the quantitative evaluation of aircraft cockpit design in terms of mission success, aircrew performance, and safety.
- (U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The major contractors are: Veda Inc., Dayton, OH; and Calspan Inc., Buffalo, NY.
- (U) Related Activities:
 - (U) PE 0602202F, Human Systems Technology.
 - (U) PE 0603205F, Aerospace Vehicle Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 2830, Advanced Life Support: Develop and demonstrate advanced aircrew life support technologies. The goal is to improve combat performance while protecting the aircrew from physiological stresses such as high altitudes, high G-forces, electro-magnetic threats, thermal burden, and ballistic injury.
 - (U) FY 1992 Accomplishments:
 - (U) Completed technology demonstration of an advanced tactical anti-G suit showing 50% better G-endurance.
 - (U) FY 1993 Planned Program:
 - (U) Develop a new aircrew spectacle frame for increased safety.
 - (U) Develop a methodology to test pressure suit gloves for dexterity, mobility, and tactility.
 - (U) Evaluate greater G-protection provided from Combat Edge subsystem improvements: full coverage anti-G suit for the lower body; and modified positive-pressure breathing profile to reduce maximum air pressure.
 - (U) FY 1994 Planned Program:
 - (U) Demonstrate aircrew laser eye protection for nighttime use.
 - (U) Complete design requirements for integrated aircrew ballistic protection with lightweight body armor.
 - (U) Develop improved positive-pressure breathing oxygen mask for high-G maneuvers and high altitude.
- (U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. The major contractors are: Boeing Advanced Systems, Seattle, WA; ILC Dover, Dover, DE; KRUG International, San Antonio, TX; Battelle Memorial Institute, Columbus, OH; and Systems Research Laboratories, San Antonio, TX.

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Program Element: #0603231F
PE Title: Crew Systems and Personnel
Protection Technology

Budget Activity: #2 - Advanced Technology
Development

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2868, Crew Escape: This project develops and demonstrates advanced crew escape technologies to protect the aircrew during ejection throughout the complete performance envelope of modern aircraft. The goal is to reduce aircrew fatalities and major injuries in emergency ejections at air speeds up to 700 Knots Equivalent Airspeed and at low altitude and adverse attitudes. This project will also improve escape system reliability, maintainability, and logistics supportability.

(U) FY 1992 Accomplishments:

- (U) Completed study of joint-Service technology needs for next generation fighter aircraft escape systems.
- (U) Developed joint-Service Acquisition Strategy Plan for technologies demonstration.

(U) FY 1993 Planned Program:

- (U) Demonstrate gelled propellant escape propulsion technologies.
- (U) Integrate the instrumented test manikin and the rocket sled to create a unique capability for demonstrating and evaluating ejection seat technologies.
- (U) Develop haulback subsystem to reduce, by 50%, time required to position the upper torso into the ejection seat prior to escape.

(U) FY 1994 Planned Program:

- (U) Conduct high-speed wind tunnel tests on windblast protection technologies.
- (U) Demonstrate integration of propulsion and flight controls using the instrumented manikin and rocket sled.

- (U) Work Performed By: This project is managed by the Armstrong Laboratory, CREST Advanced Development Program Office, Wright-Patterson AFB, OH. The program is jointly staffed and funded by: Armstrong Laboratory, Brooks AFB, TX; Wright Laboratory, Wright-Patterson AFB, OH; and Naval Air Systems Command, Washington DC. The major contractors are: SRL, Dayton, OH; Rockwell International, Los Angeles, CA; Frost Engineering, Englewood, CO; Atlantic Research Corp., Gainesville, VA; and McDonnell Douglas Missile Systems Co., Titusville, FL.

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604706F, Life Support Systems.
- (U) PE 0603269F, National Aero-Space Plane.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0603231F

Budget Activity: #2 - Advanced Technology

PE Title: Crew Systems and Personnel
Protection Technology

Development

5. (U) Project 3257, Helmet-Mounted Devices Technology: This project develops helmet-mounted optical technology to improve pilot situational awareness and ability to interact with the world in a natural, intuitive manner during day or night operations and in all-weather conditions. Future applications include an all-aspect, fire control system to allow the pilot, by head turns, to fully use all weapons. Technology development includes head-steered forward-looking infrared sensors and radar for night vision goggles.

(U) FY 1992 Accomplishments:

- (U) Demonstrated, in-flight, a night vision goggle head tracking technology for better night target acquisition.
- (U) Developed high-resolution, wide field-of-view night vision goggles.

(U) FY 1993 Planned Program:

- (U) Develop a binocular helmet-mounted display to incorporate three-dimensional audio localization, laser protection, active noise reduction, and high resolution technologies with ejection compatibility.
- (U) Demonstrate safe, effective, ejection-compatible high voltage quick disconnect capability.
- (U) Determine optimum helmet-mounted technology needed to enhance mission effectiveness.

(U) FY 1994 Planned Program:

- (U) Demonstrate a medium field-of-view binocular helmet-mounted display with three-dimensional audio localization to improve situational awareness and mission effectiveness.
- (U) Develop a cost-effective ground-based simulation capability for rapid helmet system evaluation before flight testing.

- (U) Work Performed By: This project is managed by the Armstrong Laboratory, Brooks AFB, TX. In-house development and testing are conducted by the Armstrong Laboratory, Wright-Patterson AFB, OH. The major contractors are McDonnell Aircraft Co., St. Louis, MO; Reynolds Industries Inc., Los Angeles, CA; Honeywell Military Avionics, Minneapolis, MN; S-TRON, Mountain View, CA; and Night Vision Corp., Morton Grove, IL.

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603790D, NATO Cooperative R&D.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238F Budget Activity: #2 - Advanced Technology
 PE Title: Air Defense/Precision Strike Technology Demonstration Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
4185 Near-Real-Time Precision Strike	0	4,676	14,549	Cont	TBD
4216 Global Grid	0	0	200	Cont	TBD
4217 Air Superiority	0	0	250	Cont	TBD
Total	0	4,676	14,999	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Directly supports Advanced Technology Demonstrations under the revised OSD Science and Technology (S&T) Investment Strategy by developing and demonstrating key technologies to support Precision Strike and Air Superiority and Defense thrusts. Project 4185 will simulate, integrate, and demonstrate air vehicle, strike planning, and weapon technologies to meet the capability to achieve affordable, adverse-weather (night/day) precision strike (less than three meters circular error probable (CEP)) with conventional munitions from standoff distances against time-critical fixed and mobile (stationary) surface targets. This includes: enroute targeting, using data from on-board sensors or data from off-board assets such as a reconnaissance aircraft; responsive mission planning; precision weapon delivery; and battle damage assessment. The focus includes: fusion of multi-source sensor data; linking information to shooter aircraft to produce required targeting data for download to weapon; command, control, communication, and near-real-time (minutes not hours) mission planning; strike option generation and analysis; battle damage assessment; and replan/restrike decisions. Project 4216 will simulate, integrate, and demonstrate technologies required to extend the global grid concept into any theater of conflict, at any time, in support of any mission. The project focus is on employing existing commercial fiber-optic communication infrastructure in the world coupled with additional links from the "end-points" of the commercial network to the warfighting force. Project 4217 will simulate, integrate, and demonstrate technologies for assured superiority in aerial combat environments, spanning from beyond-visual-range to within-visual-range, to successfully engage, kill, and survive existing threats. The project focus is on improved combat situation awareness, expanded weapon launch and lethal envelopes, and improved abilities to defeat or avoid threats with an advanced air-to-air attack capability. Simulations, both digital and pilot-in-the-loop, will be used to determine design requirements and most cost-effective method of providing assured air superiority.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 4216, Global Grid: Providing the warfighter a world-wide global grid communication infrastructure while making use of existing commercial fiber-optic infrastructure requires additional technologies to extend the capability into any theater of conflict, at any time, in support of any mission. In order to leverage scarce DoD resources, commercial off-the-shelf telecommunications technology will be used to the maximum extent possible to develop

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Program Element: 0603238F
PE Title: Air Defense/Precision
Strike Technology
Demonstration

Budget Activity: #2 - Advanced Technology
Development

and demonstrate a communications network composed of surface, sea, space, and air components for deployment with a joint task force and to provide self-healing, survivable, secure command, control, and communications (C3) within theater and to continental United States (CONUS) and our allies. Capabilities demonstrated will enable virtual deployment of command and control (C2) assets to the theater by allowing CONUS-based capabilities to be extended into theater via bandwidth connectivity. Commercial-based common formats and standards will provide interoperability within the Services and with allied nations to facilitate the next-generation warfighting communication capability.

(U) FY 1992 Accomplishments: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Perform communication architecture study to determine technology requirements for a wide bandwidth, self-healing, survivable, secure C3 capability.
- (U) Determine integration requirements for commercial off-the-shelf telecommunications technologies.

(U) Work Performed By: Managed by Rome Laboratory, Griffiss AFB, NY. Contractors are not yet selected.

(U) Related Activities:

(U) PE 0603726F, C3 Subsystems Integration.

(U) PE 0603728F, Advanced Computer Technology.

(U) PE 0603789F, C3 Advanced Technology Development.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4217, Air Superiority: Fighter aircraft require a high-angle, off-axis attack capability to enhance within-visual-range lethality and survivability. Simulations/evaluations indicate a significant percent of air-to-air engagements will transition to within-visual-range. Contributing factors include threat missile effectiveness, rules of engagement, threats with smaller radar cross sections, and increasing threat counts. Based on current estimates foreign fighter systems have, or soon will have, an effective high off-axis kill capability with air-to-air missiles. To counter this world-wide threat, this project will explore aircraft, weapon, countermeasures, and pilot command alternative enhancements and identify and demonstrate low-cost solutions for both survivability and first shot capability allowing pilots to

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Program Element: 0603238F

Budget Activity: #2 - Advanced Technology

PE Title: Air Defense/Precision
Strike Technology
Demonstration

Development

command engagement independent of aircraft orientation.

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Program Element: 0603238F Budget Activity: #2 - Advanced Technology
PE Title: Air Defense/Precision Development
Strike Technology
Demonstration

- (U) FY 1992 Accomplishments: Not Applicable.
- (U) FY 1993 Planned Program: Not Applicable.
- (U) FY 1994 Planned Program:
 - (U) Initiate simulations to determine operational payoff of integrated within-visual-range technology options to enhance capabilities against current and emerging threats.
 - (U) Define countermeasures, high off-boresight weapons, and fire control integration to enhance total weapon performance.
- (U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors are not yet selected.
- (U) Related Activities:
 - (U) PE 0603205F, Aerospace Vehicle Technology.
 - (U) PE 0603245F, Advanced Fighter Technology Integration.
 - (U) PE 0603270F, Electronic Warfare Technology.
 - (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238F Project Number: 4185
PE Title: Air Defense/Precision Strike Technology Demonstration Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Near-Real-Time Precision Strike	0	4,676	14,549	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Simulate, integrate, and demonstrate air vehicle, strike planning, and weapon system technologies to meet the capability to achieve affordable, adverse-weather (night/day) precision strike (less than three meters circular error probable (CEP)) with conventional munitions from standoff distances against time-critical fixed and mobile (stationary) surface targets. This includes: enroute targeting, using data from on-board sensors or data from off-board assets such as a reconnaissance aircraft; responsive mission planning; precision weapon delivery; and battle damage assessment. The focus includes: fusion of multi-source sensor data; linking information to shooter aircraft to produce required targeting data for download to weapon; command, control, communication, and near-real-time (minutes not hours) mission planning; strike option generation and analysis; battle damage assessment; and replan/restrike decisions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments: Not Applicable.
2. (U) FY 1993 Planned Program:
 - (U) Develop precision targeting models and simulations for multiple weapon delivery employing precision munitions.
 - (U) Initiate planning of simulations for automated mission planning system upgrades to enable real-time replanning and theater-wide deconfliction of precision strike missions.
3. (U) FY 1994 Planned Program:
 - (U) Conduct automatic target recognition simulation demonstration using high resolution radar data obtained from airborne surveillance aircraft.
 - (U) Initiate airborne sensor targeting measurements and multi-look sensor/Global Positioning System (GPS) targeting experiments needed to validate analytical models and error budget (source and nature of errors) for on-the-fly GPS targeting and differential GPS targeting alternatives.
 - (U) Plan a flight test program to support automated fire control experiments and precision strike drop test demonstrations.
 - (U) Continue development of automated mission planning technologies to reduce timeline from initial target detection to deconflicted air tasking and weapon delivery.
 - (U) Initiate seeker package design and weapon integration efforts to support precision strike drop test demonstrations.
4. (U) Program to Completion: This is a continuing program.

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Program Element: #0603238F Project Number: 4185
PE Title: Air Defense/Precision Strike Technology Demonstration Budget Activity: #2 - Advanced Technology Development

D. (U) WORK PERFORMED BY: Managed by Wright Laboratory, Wright-Patterson AFB, OH, with participation from Rome Laboratory, Griffiss AFB, NY. Contractors not yet selected.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: FY 1993 efforts focused on simulation and related activities.
2. SCHEDULE CHANGES: The restructured program has a revised milestone schedule as shown below.
3. COST CHANGES: The restructured program includes cost reductions to ensure fiscal sustainability.

F. (U) PROGRAM DOCUMENTATION:

- (U) Tactical Air Forces (TAF) Mission Need Statement 401-91: Adverse Weather Precision Strike Capability, 5 March 1992.
- (U) Defense Science and Technology Strategy, DDR&E, July 1992.
- (U) DepSecDef Memo, Defense Science and Technology, 19 December 1991.
- (U) UnderSecDef Memo, Science and Technology Program Guidance for FY 94-99, 31 December 1991.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603601F, Conventional Weapons.
- (U) PE 0603238A, Air Defense/Precision Strike Technology Demonstration.
- (U) PE 0603238E, Air Defense/Precision Strike Technology Demonstration.
- (U) PE 0603238N, Air Defense/Precision Strike Technology Demonstration.
- (U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) Demonstrate real-time automatic target recognition March 1994
2. (U) Demonstrate precision targeting for Global Positioning System weapons June 1994
3. (U) Fly initial targeting/fire control tests June 1995
4. (U) Demonstrate critical mission planning subsystems September 1995
5. (U) Initiate seeker captive flight tests May 1996
6. (U) Initiate remotely targeted live fire drop tests March 1997
7. (U) Complete drop tests; integrate with joint-Service demonstration September 1997

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603245F
PE Title: Advanced Flight Technology
Integration (AFTI)

Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2061 Avionics Technology Integration	7,946	9,986	6,232	Cont	TBD
2568 Air Vehicle Technology Integration	1,558	1,503	3,223	Cont	TBD
2682 Propulsion Technology Integration	1,924	5,963	5,966	Cont	TBD
2979 Weapons Technology Integration	301	198	192	Cont	TBD
Total	11,729	17,650	15,613	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program accomplishes the integration function and conducts advanced technology transition demonstrations (ATTDs) to improve the performance and supportability of existing, as well as future aircraft. The system level integration brings together the air vehicle technologies with avionics, propulsion, and weapon systems to flight demonstrate in a realistic operational environment. The integration and flight test reduces the risk and time required to transition technologies into operational aircraft. These air vehicle technology programs provide the core investment in DoD and dual-role technologies for all-weather, day/night precision strike, air superiority, and technologies for affordability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2061, Avionics Technology Integration: This project provides the integration of avionics technologies and flight demonstrates integrated aircraft technologies in a realistic operational environment. This project will also flight demonstrate the Auto Ground Collision Avoidance System (AGCAS) that is capable off automatically preventing loss of life and aircraft due to "G" induced loss of consciousness or disorientation.

(U) FY 1992 Accomplishments:

- (U) Completed Integrated Control/Avionics for Air Superiority (ICAAS) two versus eight simulations.
- (U) Integrated and flight tested advanced Forward Looking Infrared (FLIR) on the AFTI/F-16.
- (U) Integrated and flight tested the Improved Data Modem into the AFTI/F-16.

(U) FY 1993 Planned Program:

- (U) Complete Air Combat Command pilot evaluations of ICAAS technology simulations.
- (U) Complete Integrated Cockpit/Avionics for Transports (ICAT) system requirement analysis.
- (U) Complete ICAT crew system design and test plan.
- (U) Complete AFTI/F-16 close air support analysis and flight reports.

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Program Element: #0603245F
PE Title: Advanced Flight Technology
Integration (AFTI)

Budget Activity: #2 - Advanced Technology
Development

- (U) Flight test Improved Data Modem with Air Force/Army control teams.
- (U) Start demonstration of Auto Ground Collision Avoidance System (AGCAS) for fighter-type aircraft.

- (U) FY 1994 Planned Program:
 - (U) Complete Integrated Cockpit/Avionics for Transports (ICAT) software/hardware development and integration.
 - (U) Complete ICAT simulation test and evaluation.
 - (U) Continue integration of AGCAS into AFTI/F-16.

- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH, and the Armament Directorate, Eglin AFB, FL. The three prime contractors are: McDonnell Douglas, St. Louis, MO; Douglas Aircraft Co., Long Beach, CA; and General Dynamics (Lockheed), Ft. Worth, TX. Flight testing is conducted at the Air Force Flight Test Center, Edwards AFB, CA, with support from NASA.

- (U) Related Activities:
 - (U) PE 0602201F, Aerospace Flight Dynamics
 - (U) PE 0603205F, Aerospace Vehicle Technology.
 - (U) PE 0604212F, Aircraft Equipment Development.
 - (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
 - (U) PE 0603253F, Advanced Avionics Integration.
 - (U) PE 0603707E, Prototyping (Pilot's Associate Program).
 - (U) PE 0603737D, Balanced Technology Initiative.
 - (U) PE 0603601F, Conventional Weapons.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

- 2. (U) Project 2568, Air Vehicle Technology Integration: This project provides the integration and flight demonstration of aeromechanics, flight control, and vehicle subsystems technologies into an aircraft for flight demonstrations in a realistic operational environment. This project leverages Air Force funds with NASA to demonstrate and test the military utility of advanced aircraft maneuvering technologies.
 - (U) FY 1992 Accomplishments:
 - (U) Designed, fabricated, and flight tested an active device to control air flow over the aircraft nose to improve high angle-of-attack control, safety, and stability on the X-29 test bed.

 - (U) FY 1993 Planned Program:
 - (U) Design a passive vortex flow control device for F-16 flight testing to improve high angle-of-attack aircraft control.

 - (U) FY 1994 Planned Program:
 - (U) Fabricate and flight test a passive vortex flow control device on an F-16 testbed aircraft to improve high angle-of-attack control.

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Program Element: #0603245F
PE Title: Advanced Flight Technology
Integration (AFTI)

Budget Activity: #2 - Advanced Technology
Development

- (U) Develop and evaluate advanced cargo handling concepts for transport aircraft.
- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The prime contractors are: Grumman Aerospace Corp., Bethpage, NY; and General Dynamics (Lockheed), Ft. Worth, TX.
- (U) Related Activities:
 - (U) PE 0603205F, Aerospace Vehicle Technology.
 - (U) PE 0603211F, Aerospace Structures.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 2682, Propulsion Technology Integration: Develops the technologies to integrate propulsion systems (inlets, engines, and nozzles) with the airframe technologies. The Multi-Axis Thrust Vectoring (MATV) program will demonstrate unlimited angle-of-attack maneuvering using the Variable In-flight Simulator Test Aircraft F-16D and a General Electric engine with a vectoring nozzle. The Advanced Control Technology for Integrated Vehicles (ACTIVE) program will demonstrate improved cruise performance and range increase using the F-15 with Pratt and Whitney engines with vectoring nozzles. Both programs are critical experiments leading to the advanced technology demonstration program, Propulsion Aerodynamic Control Integration Research (PACIR), which starts in late FY 1994. PACIR will provide a full envelop, military utility assessment of the integrated technologies from MATV and ACTIVE.
 - (U) FY 1992 Accomplishments:
 - (U) Completed benefit analysis of fighter airframe, propulsion, and integration technologies for PACIR.
 - (U) Completed ground tests of General Electric and Pratt and Whitney axisymmetric pitch/yaw thrust vectoring nozzles.
 - (U) FY 1993 Planned Program:
 - (U) Conduct MATV flight tests of axisymmetric thrust vectoring nozzles.
 - (U) Begin ACTIVE demonstration of axisymmetric thrust vectoring nozzles.
 - (U) Define flight test requirements for the joint NASA/Air Force ACTIVE program.
 - (U) FY 1994 Planned Program:
 - (U) Complete ACTIVE flight tests.
 - (U) Define PACIR technology demonstration based upon MATV and ACTIVE results.
- (U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH, with the exception that the Advanced Control Technology for Integrated Vehicles program will be managed by NASA/Ames Dryden Flight Research Facility, Edwards AFB, CA, since it is funded primarily by NASA. The

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Program Element: #0603245F
PE Title: Advanced Flight Technology
Integration (AFTI)

Budget Activity: #2 - Advanced Technology
Development

prime contractors are: General Dynamics (Lockheed), Ft. Worth, TX; McDonnell Douglas, St. Louis, MO; General Electric, Evendale, OH; and Pratt and Whitney, West Palm Beach, FL.

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603216F, Aerospace Propulsion and Power.
- (U) PE 0604237, Variability In-flight Simulator Test Aircraft
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2979, Weapons Technology Integration: This project integrates weapons with the air vehicle technologies to optimize precision strike of high value enemy targets. Emphasis is on the integration of sensor targeting and pilot interaction to acquire and kill time-critical mobile and hard targets in adverse-weather. Integration of weapons includes physical integration as well as functionally controlling (arming and releasing) the weapons. Air vehicle performance (observability, maneuverability, and speed) should not be degraded nor should any of the air vehicle subsystems be adversely affected. Project 2979 was renamed in FY 1992.

(U) FY 1992 Accomplishments:

- (U) Transitioned the Self-Repairing Flight Control System maintenance diagnostics module into an advanced aircraft integrated maintenance information system.

(U) FY 1993 Planned Program:

- (U) Develop weapon simulation models and assess radar cross section (RCS) of advanced fighters/weapons.

(U) FY 1994 Planned Program:

- (U) Complete assessment of advanced fighters/weapons models' RCS test data and write final report.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH. The primary contractors are: General Dynamics (Lockheed), Ft. Worth TX; and McDonnell Douglas Co., St. Louis, MO.

(U) Related Activities:

- (U) PE 0603601F, Conventional Weapons.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Budget Activity: #2 - Advanced Technology
 Laboratory Development

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Lincoln Laboratory	25,233	24,958	22,908	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Lincoln Laboratory Program is a high technology research and development effort conducted through a cost reimbursable contract with the Massachusetts Institute of Technology (MIT). Lincoln Laboratory is operated as a Federally Funded Research and Development Center (FFRDC) administered by the Department of Defense. Lincoln Laboratory provides advanced research and technology demonstration in the areas of military satellite communications, space radar technology, space-based visible surveillance, deep-space and tactical battlefield surveillance, advanced solid state devices, materials, and processing technology. The Laboratory continues to be a leader in providing critical enabling technologies for advanced space surveillance and communication systems and ensures the Air Force maintains its technology leadership role in advanced electronics.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Demonstrated charge coupled device (CCD) chips with greater than one million pixels for visible and ultraviolet imaging, radiation hardened to one megarad.
- (U) Improved the quantum efficiency of germanium-silicon (GeSi-Si) heterojunction detectors and developed integrated silicon microlens arrays to increase sensitivity.
- (U) Increased the processing capacity of CCD neural network chips to 4×10^9 operations per second for automated image processing.
- (U) Fabricated arrays of integrated electronic and optical components for implementation of early-vision neural network.
- (U) Developed and demonstrated signal distribution structures for compact millimeter wave (MMW) circuits using multiple superconductive and insulating layers.
- (U) Demonstrated full shared memory operation of a Reduced Instruction Set Computer (RISC) multiprocessor testbed with two processor nodes coupled by a free-space optical interconnect with one gigabits per second (Gbps) data paths.
- (U) Developed space-qualified optical fiber nutator and heterodyne receiver front-end.
- (U) Completed theoretical analysis of a solid state laser three-dimensional synthetic aperture radar (SAR).
- (U) Developed an algorithm to detect and copy spectrally narrow weak signals in strong, wideband interference.
- (U) Developed 1.5 watt nearly diffraction-limited laser power amplifier.

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Program Element: 0603250F
PE Title: Lincoln
Laboratory

Project Number: 649L
Budget Activity: #2 - Advanced Technology
Development

- (U) Demonstrated one gigabits per second (Gbps)/one watt optical transmitter.
 - (U) Completed top level design of third-generation, compact, programmable, 12 giabit operations per second (GOPS) processor to support formation of high-resolution, real-time synthetic aperture radar (SAR) images.
 - (U) Demonstrated three Gbps externally modulated optical link.
 - (U) Developed and demonstrated two-element optical nulling for a radio frequency phased array antenna.
 - (U) Demonstrated low noise platinum silicide (PtSi) Schottky-barrier and germanium-silicon (GeSi-Si) heterojunction infrared detector arrays (512X488 pixels).
 - (U) Developed advanced large ultraviolet-visible (UV-VIS) imagers for space and missile surveillance.
2. (U) FY 1993 Planned Program:
- (U) Develop new generation charge coupled device (CCD) neural network chips with ten times higher capacity.
 - (U) Demonstrate opto-electronic implementation of early-vision neural network subsystem.
 - (U) Demonstrate monolithic arrays of surface-emitting diode lasers with 100 watts of continuous wave (cw) power.
 - (U) Demonstrate high-temperature thin-film superconductive devices for high-speed signal processing.
 - (U) Develop/demonstrate multispectral medium-wavelength and long-wavelength infrared detector arrays for space surveillance.
 - (U) Design a gate array to encode/decode a five Gbps message and design all control functions for an optical ring network.
 - (U) Complete detailed design of a third-generation, compact, programmable 12 GOPS processor.
 - (U) Develop spaceborne photonics technology for microwave antenna nulling and phased arrays.
 - (U) Develop fiber coupled transmitter module.
 - (U) Demonstrate advanced visible and infrared focal plane arrays (FPAs) in experimental sensors at the Experimental Test Site.
 - (U) Develop direction-finding and copy algorithms which exploit waveform features and which achieve high performance bounds.
 - (U) Develop wavelength division multiplexing (WDM) technology for space and ground applications.
 - (U) Demonstrate CCD chips for stable, low-noise visible and ultraviolet imaging with greater than one million pixels, radiation hardened to three megarad.
 - (U) Demonstrate ten Gbps optical link.
 - (U) Extend coder/decoder to ten Gbps.
 - (U) Improve sensitivity in GeSi-Si detector arrays with integrated silicon microlens arrays.
3. (U) FY 1994 Planned Program:
- (U) Embed CCD neural network chips into a neural network signal processor.
 - (U) Demonscrate the utility of an opto-electronic neural network subsystem for automatic target recognition.
 - (U) Begin development of a space-qualified high-power transmitter.
 - (U) Begin development of a space network node testbed.
 - (U) Develop an all optical, high-speed switch for time division multiplexing systems.
 - (U) Develop, demonstrate, and transfer a technology for rapid prototyping of multi-chip modules based on laser programmable substrates.

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Program Element: 0603250F
PE Title: Lincoln
Laboratory

Project Number: 649L
Budget Activity: #2 - Advanced Technology
Development

- (U) Develop hybrid multichip free-space optical interconnects for shared memory multiprocessors.
- (U) Demonstrate an optical ring network with 16 gigabits per second (Gbps) internodal data rate.
- (U) Flight test an optical three-dimensional synthetic aperture radar (SAR).
- (U) Flight demonstrate optical processing on a Schottky camera.
- (U) Continue to develop and demonstrate large multichip multi-megapixel (1024X1024) focal plane arrays (FPAs) optimized for ultraviolet, visible, and infrared space surveillance.
- (U) Complete third-generation, compact, programmable 12 gigabit operations per second (GOPS) prototype processor.
- (U) Continue development of wavelength division multiplexing (WDM) technology to extend data rate handling to 50 Gbps.
- (U) Develop photonics technology for microwave antenna beam steering.
- (U) Develop adaptive coherent receiver for high-speed optical downlink through atmospheric turbulence.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: There are no prime contractors that support this program. Funds are used to pay salaries and purchase supplies for in-house activities at Lincoln Laboratory.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Lincoln Laboratory Federally Funded Research and Development Center (FFRDC) Charter, 1952.
- (U) DOD Plan for Administration of Lincoln Laboratory, May 1975.

G. (U) RELATED ACTIVITIES:

- (U) PE 0303603F, Milstar.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0102424F, Space Track.
- (U) PE 0102428F, Space Surveillance Technology.
- (U) PE 0303401F, Communications Security.
- (U) PE 0601102F, Defense Research Sciences.
- (U) PE 0601101E, Defense Research Sciences.
- (U) PE 0602301E, Wafer-Scale Integration.
- (U) PE 0603789F, Command, Control, Communications, and Intelligence.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603253F Budget Activity: #2 - Advanced Technology
 PE Title: Advanced Avionics Development
Integration

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
666A Advanced Reference Systems Development	3,088	3,249	3,493	Cont	TBD
2733 Advanced Reconnaissance/Strike Radars	6,276	6,376	6,567	Cont	TBD
2735 Advanced Systems Avionics Applications	3,698	10,584	16,814	Cont	TBD
3833 Sensor Integration for Covert Penetration	<u>2,178</u>	<u>2,868</u>	<u>3,510</u>	<u>Cont</u>	<u>TBD</u>
Total	15,240	23,077	30,384	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates technology to improve radar, communications, navigation, identification, and cockpit display integration in order to improve overall aircraft performance and reduce pilot workload during mission operations, as well as reduce avionics support costs. Program develops and improves navigation technology to include: solid state and stellar inertial guidance units and Global Positioning System (GPS) receivers; motion compensation techniques to address the documented problem of synthetic aperture radar image smearing during turbulent flight conditions; foliage penetration radar to find concealed/camouflaged targets; highly reliable and easily maintainable avionics architectures and advanced processors, to include artificial intelligence processors for aircrew workload reduction and situation awareness; and integration techniques to reduce aircraft electronic emissions for improved aircraft hostile airspace penetration capability. The standard avionics architecture developments in this program build on the Pave Pillar program, which was funded by this program and is the foundation to the Joint Integrated Avionics Working Group (JIAWG) common avionics baseline. In FY 1993, increased emphasis began on development and demonstration of passive IR search and track algorithm and processor technology. In FY 1994, final design, component fabrication, software, and test will be accomplished.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 666A, Advanced Reference Systems Development: Develops and demonstrates navigation sensors, integration techniques, and software to improve accuracy and availability of navigation information for current and future weapon systems. This will assure aircraft survival and precision weapon delivery, increase reliability, and reduce operations and maintenance cost. Major thrusts are jam resistant navigation receivers, multi-function antenna systems, and reliable strapdown stellar inertial systems.

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Program Element: #0603253F
PE Title: Advanced Avionics
Integration

Budget Activity: #2 - Advanced Technology
Development

(U) FY 1992 Accomplishments:

- (U) Demonstrated multifunction antenna in anechoic chamber for two megahertz (MHz) to six gigahertz (GHz) communication, navigation, identification, and electronic warfare technologies.
- (U) Demonstrated wide-angle-tracker lens to prove feasibility of eliminating costly gimbals with strapdown stellar inertial sensors.

(U) FY 1993 Planned Program:

- (U) Fabricate strapdown stellar inertial sensor for lab test.
- (U) Complete test of integrated multifunction antenna and supporting electronics for two MHz to six GHz communication, navigation, identification, and electronic warfare technology.

(U) FY 1994 Planned Program:

- (U) Design advanced inertial network to maintain in-flight boresight alignment of mission sensors and weapons.
- (U) Flight test strapdown stellar inertial sensor for airborne navigation applications.
- (U) Define Global Positioning System enhancements to improve threat emitter location.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: TRW, San Diego, CA; Northrup, Hawthorne, CA; McDonnell Douglas, St. Louis, MO; Draper Laboratory, Cambridge, MA; and General Dynamics, Fort Worth, TX.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603109N, Integrated Electronic Warfare System.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2733, Advanced Reconnaissance/Strike Radars: Develops and demonstrates radar technologies and techniques for automatically detecting and targeting ground and airborne targets in difficult background conditions, with emphasis on countering improvements in low-observable (LO) technology and camouflage, concealment, and deception techniques that limit current capability to detect and track LO and concealed/camouflaged targets.

(U) FY 1992 Accomplishments:

- (U) Validated target and foliage models for evaluating concealed target detection algorithms.

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Program Element: #0603253F
PE Title: Advanced Avionics
Integration

Budget Activity: #2 - Advanced Technology
Development

- (U) Developed laboratory simulation to inexpensively validate new radar motion compensation techniques prior to flight testing.

(U) FY 1993 Planned Program:

- (U) Demonstrate adverse-weather, near-real-time automatic target recognition (ATR) capability.
- (U) Validate simulation tool for laboratory testing ultra-high resolution synthetic aperture radar (SAR) motion compensation techniques using recorded flight data.
- (U) Develop algorithms and preliminary design of foliage penetration radar for reliable concealed/camouflaged time-critical target detection.

(U) FY 1994 Planned Program:

- (U) Develop foliage penetration wide-area search and cueing sensor for reliably detecting time-critical targets.
- (U) Develop adaptive clutter/interference rejection techniques for detecting ground and low-observable airborne targets in difficult environments.
- (U) Conduct technology trade off studies for wide area search and cueing foliage penetration sensor for reliably detecting hidden/camouflaged time-critical targets.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: ERIM, Ann Arbor, MI; Loral Systems, Litchfield Park, AZ; Martin Marietta, Denver, CO; and Holomax Ltd., Toronto, Canada.

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3833, Sensor Integration for Covert Penetration: Develops and demonstrates technologies and techniques to provide current and future aircraft with capability to penetrate areas without being detected due to radio frequency and other emissions. These emissions reveal aircraft presence and limit covert penetration capability, but are required by most current avionics suites to provide the pilot with needed information. Efforts concentrate on sensors for nap-of-the-earth flight in day or night, integrating reduced emission, real-time threat detection and avoidance capabilities, low probability of intercept (LPI) communication, and sensor management for data fusion.

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Program Element: #0603253F
PE Title: Advanced Avionics
Integration

Budget Activity: #2 - Advanced Technology
Development

(U) FY 1992 Accomplishments:

- (U) Tested an integrated laser-based threat avoidance and obstacle avoidance capability.
- (U) Demonstrated integration of advanced Global Positioning System technologies into system avionics architecture to reduce location errors by providing a common reference.
- (U) Demonstrated data fusion algorithms for threat identification and location using existing sensors supported by linking laboratory test and evaluation capabilities.

(U) FY 1993 Planned Program:

- (U) Conduct operational test demonstration of integrated avionics for threat avoidance and laser obstacle avoidance capability.
- (U) Develop sensor models for analysis of sensor management techniques based on demonstrated data fusion algorithms which will improve advanced threat identification and location capability for on-board replanning and terrain following using existing sensors.
- (U) Demonstrate common module reconfiguration strategies, Ada software partitioning approach for distributed filters, and pooled spare concepts for robust fault tolerant capability that will support advanced avionics and retrofits.

(U) FY 1994 Planned Program:

- (U) Develop robust database management system for real-time avionics permitting information sharing amongst sensor subsystems.
- (U) Demonstrate improved threat location and identification for on-board route replanning and terrain following using in-house simulation of integrated data fusion sensor management techniques with sensor models.
- (U) Define requirements to receive, securely handle, process, and store intelligence information in a totally integrated avionics architecture.

(U) Work Performed By: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: IBM, Owego, NY; and TRW, Dayton, OH.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603253F
PE Title: Advanced Avionics
Integration

Project Number: 2735
Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Advanced Systems Avionics Applications					
	3,698	10,584	16,814	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Develops and demonstrates technologies that will allow sharing of common assets among distributed functions to reduce avionics support costs, increase sortie rates from bare bases, and provide aerospace vehicles with affordable high speed signal and data processing. This encompasses integrated avionics architectures and core processors, highly reliable avionics, and improved packaging and cooling technologies. Increased emphasis began in FY 1993 on development and demonstration of passive IR search and track algorithm and processor technology. In FY 1994, final design, component fabrication, software, and test will be accomplished.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed design requirements definition for ultra-reliable digital modules to provide increased processing capacity, needed for automatic target cueing in infrared targeting pods, and twenty times reliability improvements.
- (U) Completed design concept for ultra-reliable radio frequency (RF) modules for radar upgrades to provide for order of magnitude increase in mean time between failure.
- (U) Evaluated performance of Air Force avionics-applications algorithms using ALADDIN high speed 32-bit processor module.

2. (U) FY 1993 Planned Program:

- (U) Provide design specifications for Joint Integrated Avionics Working Group (JIAWG) compatible modular and shareable resources to support low-cost integrated sensor technologies.
- (U) Develop adaptive processing technology for incorporation into advanced infrared search and track sensor that will be integrated into an avionics suite for evaluation.
- (U) Complete design of an ALADDIN-class supercomputer repackaged in a JIAWG compatible standard format to meet fighter requirements for advanced avionics subsystems.
- (U) Design ultra-reliable RF modules to improve life cycle cost of fighter radar phased array antennas.
- (U) Develop and test real-time artificial intelligence brassboard for cost-effective expert system and database processing.

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Program Element: #0603253F
PE Title: Advanced Avionics
Integration

Project Number: 2735
Budget Activity: #2 - Advanced Technology
Development

3. (U) FY 1994 Planned Program:

- (U) Develop a modular, Standard Electronic Module-E (SEM-E) format, radio frequency synthesizer for aircraft radars to enable two-level maintenance.
- (U) Complete adaptive processing technology, incorporate into . . . advanced infrared search and track sensor, and begin fabrication of processor and unique test equipment for use in demonstration phase.
- (U) Validate performance of real-time artificial intelligence processor brassboard as a cost-effective processor for expert system and database applications.
- (U) Refine design for ultra-reliable digital and radio frequency modules needed for an integrated sensor which will provide for increased reliability and reduced cost, weight, volume, and power over current federated sensor systems.
- (U) Complete algorithm processing requirements definition and functional design for scalable real-time parallel network to provide for the advanced processing needs of automatic target recognition and infrared missile warning.
- (U) Integrate band-independent, adaptive communications waveform into integrated communications, navigation, and identification avionics.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Managed by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Westinghouse Electric Corp., Baltimore, MD; TI, Dallas, TX; AT&T, Whippany, NJ; McDonnell Douglas, St. Louis, MO; IBM, Owego, NY; and Georgia Technical Research Institute, Atlanta, GA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: The advanced infrared search and track program was delayed three months for a protest by the losing bidder which was dismissed in February 1993.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Air Combat Command Advanced Avionics Technology Requirements Memo, October 1991.

G. (U) RELATED ACTIVITIES:

- (U) PE 0601729A, Night Vision Electro-optics.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.

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Program Element: #0603253F
PE Title: Advanced Avionics
Integration

Project Number: 2735
Budget Activity: #2 - Advanced Technology
Development

(U) PE 0604609F, Reliability and Maintainability Technology Insertion Program.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|--|---------------|
| 1. (U) Complete photonic backplane | July 1992 |
| 2. (U) Complete infrared search and track (IRST)
preliminary design | June 1993 |
| 3. (U) Complete modular radio frequency packaging | June 1993 |
| 4. (U) Complete advanced avionics packaging | December 1993 |
| 5. (U) Complete IRST critical design | December 1993 |
| 6. (U) Complete ultra-reliable digital avionics | December 1996 |
| 7. (U) Integrate sensor system | May 1998 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63260F
 PE Title: Intelligence Advanced Development

Budget Activity: # 4 Tactical Programs

A. (U) Resources (\$ in Thousands)

<u>Project</u>					
<u>Number</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>To</u>	<u>Total</u>
<u>Title</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
3479 Advanced Sensor Exploitation	973	1,511	1,320	Cont	TBD
3480 Automated Imagery Exploitation	1,314	2,029	1,707	Cont	TBD
3481 Knowledge Based Technology for Intelligence	1,322	2,135	1,864	Cont	TBD
3482 Scientific & Technical Intelligence Methodologies	765	1,495	1,243	Cont	TBD
Total	4,374	7,170	6,134	CONT	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates advanced technology intelligence systems capabilities and techniques to support tactical and strategic commanders and National Command Authority needs for timely and all source intelligence information. IAD is composed of four software projects developed for the Air Force at Rome Labs (RL). These projects expand and improve data storage, retrieval and handling capabilities; satisfy needs for near-real-time data processing, exploitation and dissemination from present and future advanced sensors. RL works directly with the users, employing a rapid prototyping evolutionary approach, integrating finished modules directly into the field. The programs are oriented toward specific shortfalls and deficiencies as defined by the major commands (MAJCOMs), unified & specified commands, and intelligence organizations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3479, Advanced Sensor Exploitation (ASE): Correlates various sources of intelligence (COMINT, ELINT, and imagery) within seconds as opposed to hours with current manual methods. Project includes development of data correlation and predictive intelligence algorithms, target analysis and prioritization, air order of battle update, and C3CM tactical analysis techniques. 3479, includes RAAP, the targeting module for the Contingency Theater Automated Planning System (CTAPS) and software supporting the Intelligence Correlation Module (ICM). This computerized approach will speed up the correlation of data from diverse sources of intelligence information, including COMINT, ELINT, and imagery; providing faster situational awareness and threat assessments, replacing manual systems with automated capabilities.

(U) FY 1992 Accomplishments:

- (U) Continued Rapid Application of Air Power (RAAP) development directed towards a full-scale prototype including ICM interfaces.

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Program Element: 63260F

Budget Activity: # 4 Tactical Programs

PE Title: (U) Intelligence Advanced Development (IAD)

- (U) Initiated Tactical Intel Fusion effort to expand the development of advanced correlation/fusion capabilities, incorporating components of ASE, RAAP, and other Rome Laboratory developments.

(U) FY 1993 Planned Program:

- (U) Continue Tactical Intel Fusion effort to expand the development of advanced correlation/fusion capabilities.
- (U) Complete development of RAAP full scale prototype.
- (U) Initiate effort to develop Electronic Footlocker (a rapid deployment package for intelligence in support of flying operations).
- (U) Interface RAAP to the Advanced Planning System (APS) module of CTAPS.

(U) FY 1994 Planned Program:

- (U) Continue the intelligence fusion effort.
- (U) Continue the Electronic Footlocker effort.
- (U) Initiate an effort to develop an operational fusion demonstration and evaluation environment that can be used to resolve system integration, operational, and interoperability problems prior to fielding in an operational environment.

(U) Work Performed By: The program is managed by Air Force Material Command (AFMC), with project efforts conducted by Rome Labs, Griffiss AFB, NY. The major contractors are: PAR Technologies, Inc., New Hartford, NY; Synectics Corp., Fairfax, VA; Control Data Corp., Minneapolis, MN; GTE, Mountain View, CA; Delfin Systems, Sunnyvale, CA; Language Systems, Woodland Hills, CA; E-Systems, Garland, TX; BDM Corp., McClean, VA, and Harris Corporation, Melbourne, FL.

(U) Related Activities. IAD develops techniques, algorithms, software, and prototypes utilizing advanced technologies relating to various programs including:

- (U) Program Element #0102310F, NCMC TW/AA
- (U) Program Element #0207431F, Tactical Air Intelligence Systems.
- (U) Program Element #0207435F, Tactical Imagery Processing, Exploitation, and Dissemination.
- (U) Program Element #0207438F, Theater Battle Management C3I
- (U) Program Element #0303152F, WWMCCS Information System.
- (U) Program Element #0305906F, NCMC TW/AA
- (U) Program Element #0602702F, Command, Control, & Communications
- (U) Program Element #0603726F, C3I Subsystems Integration.
- (U) Program Element #0604321F, Joint Tactical Fusion Program.
- (U) Program Element #0604750F, Intelligence Equipment.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: 63260F

Budget Activity: # 4 Tactical Programs

PE Title: (U) Intelligence Advanced Development (IAD)

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3480. Automated Imagery Exploitation (AIE): This project develops the capability to more accurately and quickly interpret digital aerial photography by developing computer assisted techniques to manipulate and overlay imagery, cartographic, SIGINT, and on line intelligence data. The results of this effort will be more precise target locations and IDs, precise target reference scenes, and more accurate damage assessments; all developed for easily supportable, low cost commercially available computer workstations. The project will also develop data links which can be used to provide detailed imagery to theater and tactical units.

(U) FY 1992 Accomplishments:

- (U) Completed evaluation of the Semi-Auto Multi-sensor Multi-spectral Exploitation (SAMME) computer model.
- (U) Implemented target graphics into the IE 2000 testbed.
- (U) Initiated efforts to address problems of imagery storage, retrieval, and correlation.
- (U) Completed advanced reference and terminal homing scene graphics.
- (U) Completed IE-2000 Testbed physical configuration.

(U) FY 1993 Planned Program:

- (U) Complete IE-2000 Testbed special applications programs.
- (U) Initiate an effort to utilize the IE 2000 Testbed to demonstrate Electronic Footlocker techniques.
- (U) Develop techniques to provide timely SIGINT cueing techniques to support imagery exploitation.
- (U) Initiate development of a receive/transmit capability for secondary imagery dissemination from many sources.
- (U) Initiate development of Air Combat Command (ACC) intel network compliant with open systems architecture to integrate imagery and intelligence data handling systems on the same network.

(U) FY 1994 Planned Program:

- (U) Initiate improved battlefield damage assessment at the unit level to support decision whether to reattack.
- (U) Implement advanced automatic target recognition algorithms into IE 2000.
- (U) Initiate an effort to develop an Air Force standard imagery system usable for all CTAPS applications.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

(U) Other Appropriation Funds: Not Applicable.

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Program Element: 63260F

Budget Activity: # 4 Tactical Programs

PE Title: (U) Intelligence Advanced Development (IAD)

(U) International Cooperative Agreements: Negotiations with France for the Imagery Information Reformatter (I2R) are complete; DoD has approved MOU. France is staffing MOU.

3. (U) Project 3481. Knowledge Based Technology for Intelligence:

This project will reduce manpower and warning times for respective STRATCOM, SPACECOM, and AFIC intelligence data handling systems. The development of the analytical aids is based on artificial intelligence techniques. The increased timeliness, efficiency and effectiveness derived will provide more warning time and accuracy, allowing national/military authorities a greater range of options to avert, diminish or control a crisis. This project also develops a machine translator for Spanish, Arabic, and Russian.

(U) FY 1992 Accomplishments:

- (U) Continued to build a generic message parsing system.
- (U) Continued user evaluation of the Intel Timeline Analysis Expert System in an operational environment.
- (U) Continued transition of the Timeline Analysis System.
- (U) Initiated an effort to build a machine-aided voice translation prototype.
- (U) Continued work on radar warning receiver model.
- (U) Initiated work on event categorization aid for the Tactic Analysis Expert System developed earlier.

(U) FY 1993 Planned Program:

- (U) Demonstrate Generic Message Parsing Expert System for intelligence data processing.
- (U) Continued development of machine translator.
- (U) Transition the Intelligence Timeline Expert System to operational users.
- (U) Develop multi-domain/multi-command Intelligence Timeline Analysis Expert System.
- (U) Continue event categorization at AFIC, test voice transition system at AFSOC
- (U) Conduct work on providing advanced analytical tools for current intelligence analyst at AFSPACECOM.

(U) FY 1994 Planned Program:

- (U) Complete spoken and typed Russian/Arabic/Spanish to English and vice-versa machine translator.
- (U) Evaluate generic message parser in an operational environment.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

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Program Element: 63260F

Budget Activity: # 4 Tactical Programs

PE Title: (U) Intelligence Advanced Development (IAD)

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3482. Scientific and Technical Intelligence Methodologies: Conducts research on intelligence methodologies and develops operational employment simulation models for Air Force Foreign Aerospace Science Technology Center (FASTC) requirements. The technologies developed will help FASTC improve their analysis of current and future foreign weapons systems, and prevent technological surprise with regard to the capabilities of these systems.

(U) FY 1992 Accomplishments:

- (U) Completed development of system to analyze Cobra Shoe data.
- (U) Continued radar database extraction tool development.
- (U) Initiated Intelligence Analyst Associate development.

(U) FY 1993 Planned Program:

- (U) Develop automated tools to integrate and couple computer models between various branches at FASTC.
- (U) Complete the radar analyst assistant task.
- (U) Continue the development of the tool set to assist in the management of models and simulations.
- (U) Upgrade modeling capability of foreign aircraft.
- (U) Implement effort on space employment simulation for FASTC to support analysis of space systems employment through simulation.
- (U) Implement effort to develop an automated prototype document classifier to permit automatic indexing of textual information.

(U) FY 1994 Planned Program:

- (U) Develop automatic ID of abnormal worldwide events.
- (U) Continue automatic document classification effort.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

(U) Other Appropriated Funds: Not Applicable.

(U) International Agreements: Not Applicable.

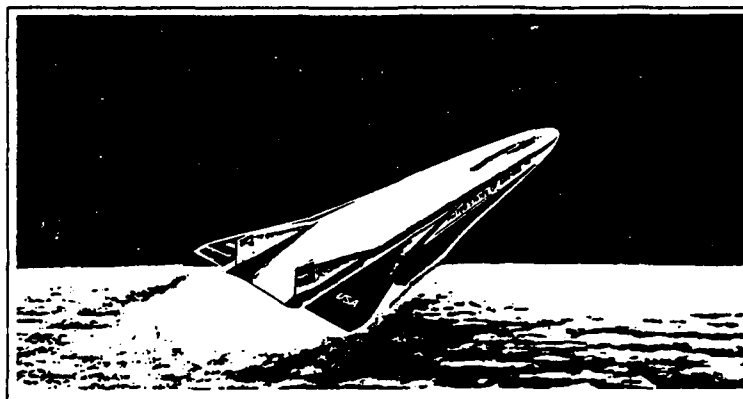
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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603269F Project: #3384
 PE Title: National Aero-Space Plane Budget Activity: #2 - Advanced Technology
(NASP) Technology Program Development

Project Title: NASP Technology Program



POPULAR NAME: X-30, NASP

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	Continue Phase 2D	Continue Phase 2D	Complete Phase 2D	Complete Phase 3
Engineering Milestones	Large Structures Tests Completed	Subscale Engine Test Completed	Concept Demo Engine Test Completed	Design and Build X-30
TtE Milestones	N/A	N/A	N/A	Flight Testing
Contract Milestones	Continue Phase 2	Continue Phase 2	TBD	Complete Phase 3
BUDGET				Program Total
(\$000)	FY 1992	FY 1993	FY 1994	(To Complete)
Propulsion	86,112	70,360	23,071	(TBD)
Airframe	65,060	42,388	15,528	(TBD)
Government Work	36,482	19,319	2,480	(TBD)
Applications	1,169	662	186	(TBD)
Support Contract	3,105	3,829	925	(TBD)
In-House Support	4,198	2,975	819	(TBD)
GFE/Other	1,988	1,711	250	(TBD)
Total ¹	198,114	141,244	43,259	(TBD)

¹Detailed funding breakouts shown above the "Total" line represent a pro-rata DoD share of joint DoD/NASA program. Total program for FY 1992 is \$205M, FY 1993 is \$141M, and FY 1994 is \$123M.

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Program Element: #0603269F
PE Title: National Aero-Space Plane
(NASP) Technology Program

Project: #3384
Budget Activity: #2 - Advanced Technology
Development

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program element funds the DoD portion of the joint, Presidentially-directed (reaffirmed and updated in July 1989) DoD/NASA technology development and demonstration program for a National Aero-Space Plane (NASP). The goal of the NASP program is to develop the technological basis for runway-launched space transportation vehicles capable of single-stage-to-orbit (SSTO) and for aircraft capable of hypersonic flight in the atmosphere. The technologies are planned to be demonstrated in a flight research vehicle, the X-30, which is envisioned to be an experimental airbreathing, hydrogen-fueled, SSTO vehicle capable of operating (horizontal takeoff/landing) from conventional runways. Following successful demonstration, the technologies will provide the basis for military and civil vehicles capable of: global unrefueled operation, reaching any point on the globe in two hours or less; providing routine, "on demand" access to near space; and, flexibly-based, rapid-response space launch. Future NASP-derived vehicles (NDVs) could satisfy mission need statements and would provide revolutionary increases in military capability and help the U.S. maintain its world leadership position in aerospace.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: Program accomplishments and plans for each fiscal year reflect total program (DoD and NASA) funding.

1. (U) FY 1992 Accomplishments:

- (U) Completed wind tunnel tests on contractor unique wind tunnel models and combined configuration team models.
- (U) Completed testing on a four foot x four foot x eight foot fuselage section integrated with a 500 gallon tank filled with liquid hydrogen fuel. Both components of the test article made from advanced composite materials and tested under thermal (1300 degrees Fahrenheit) and mechanical loads simulating up to Mach 10 flight conditions.
- (U) Conducted tests on structural articles including testing of a titanium matrix composite panel through 150 thermal life cycles, tests of a carbon-carbon panel to simulate acoustic loads on an engine nozzle surface, and a carbon-carbon wing box loads test at room temperature and at 1915 degrees Fahrenheit.
- (U) Completed Mach 5 tests of a module-to-module engine rig.
- (U) Completed initial test series on a low speed engine rig.
- (U) Finalized initial design of concept demonstration engine.
- (U) Conducted inflight tests of external burning concept.
- (U) Produced high ratio of solid to liquid hydrogen, called slush hydrogen, and evaluated transfer characteristics.
- (U) Completed third design cycles of selected X-30 vehicle configuration.
- (U) Conducted operability, supportability, and utility studies.
- (U) Transferred NASP-derived technologies to civil and commercial sector.

2. (U) FY 1993 Planned Program:

- (U) Complete subscale engine tests.
- (U) Complete design and manufacture of concept demonstration engine (CDE) test article and start CDE testing.
- (U) Complete design of large structural articles.
- (U) Test aerodynamic models for forces and moments at supersonic speeds.
- (U) Characterize titanium metal matrix composite material on a limited number of test articles.

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Program Element: #0603269F

Project: #3384

PE Title: National Aero-Space Plane
(NASP) Technology Program

Budget Activity: #2 - Advanced Technology
Development

- (U) Conduct propulsion component and engine materials and structures tests.
- (U) Initiate work on boundary layer transition and scramjet propulsion experiments.
- (U) Characterize slush hydrogen fuel handling techniques.
- (U) Transfer NASP technologies to civil and commercial sector

3. (U) FY 1994 Planned Program:

- (U) Complete concept demonstration engine (CDE) test.
- (U) Complete testing of engine materials and conduct materials characterization on coupon and panel-size (20 inch x 20 inch) test articles.
- (U) Test actively-cooled engine panels at simulated hypersonic heat loads in the range of 1000-1800 degrees Fahrenheit.
- (U) Continue work on boundary layer transition and scramjet propulsion experiments.
- (U) Transfer NASP technologies to civil and commercial sector

4. (U) Program to Completion:

- (U) Design, fabricate, and test X-30 flight research vehicle.
- (U) Demonstrate research objectives met.

D. (U) WORK PERFORMED BY: This is a joint DoD/NASA program. The Air Force has overall responsibility. A Joint Program Office at Wright-Patterson AFB, OH, executes the program. Technology development is conducted by contractors, universities, and DoD and NASA laboratories and centers. The national contractor team is managed by a National Program Office located at Palmdale, CA. Contractors for engine development are: Pratt and Whitney, West Palm Beach, FL; and Rocketdyne, Canoga Park, CA. Airframe design and component development contractors are: Lockheed, Fort Worth, TX; McDonnell Douglas, Saint Louis, MO; and Rockwell, Downey, CA. The contractors formed a national team in May 1990 and are now pursuing a single X-30 airframe and engine design.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Deleted fabrication and test of a slush hydrogen fuel tank and subsystems. Deleted aerodynamic force and moment test of a powered model at transonic speeds. Deleted final test series for the low speed engine. Deleted 4th design cycle. These changes to the FY 1993 Planned Program are due to a lower than requested FY 1993 appropriation. Boundary layer transition and scramjet propulsion experiments have been added to reduce technical risk and provide data in support of a decision to design, build, and test the X-30.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: The DoD FY 1993 appropriation was \$150M compared to the requested \$175.5M. The \$150M was further decreased to \$141M by general RDT&E reductions and various DoD adjustments. The NASA FY 1993 appropriation was zero. Therefore, the total NASP FY 1993 appropriation, DoD and NASA combined, was \$141M compared to the requested \$255M.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 07-79, Jun 79.
- (U) AFSPACECOM SON 06-84, Mar 86.
- (U) Memorandum of Agreement for NASP (Air Force/Navy/SDIO/DARPA), 25 Apr 86.
- (U) DoD/NASA Memorandum of Understanding, 27 Sep 88.

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Program Element: #0603269F

Project: #3384

PE Title: National Aero-Space Plane
(NASP) Technology Program

Budget Activity: #2 - Advanced Technology
Development

- (U) SAC/AFSPACCOM Memorandum of Agreement, 27 Nov 90.
- (U) NASP Program Management Plan, 30 Jan 91.
- (U) NASP Program Management Directive, 16 Mar 92.

G. (U) RELATED ACTIVITIES:

- (U) NASP is a joint DoD/NASA program. Participation among DoD organizations is governed by a Memorandum of Agreement (MOA), signed by all Services/Agencies and by the Under Secretary of Defense for Research and Engineering, dated 25 Apr 86.
- (U) The relationship between DoD and NASA is governed by a Memorandum of Understanding (MOU), signed by the Secretary of Defense and the NASA Administrator, dated 27 Sep 88.
- (U) Broad programmatic policy and direction are provided to the NASP program by the NASP Steering Group, chaired by the Under Secretary of Defense (Acquisition) with the NASA Deputy Administrator as Vice-Chairman. All other participating organizations have members. The Director, White House Office of Science and Technology Policy, is an ex-officio member. The NASP Steering Group approves all changes in program goals, objectives, funding, and schedules.
- (U) This program has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
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See Section C for testing accomplished on airframe and engine components.

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
Submit Research Plan	4Q/FY 1993	
X-30 First Atmospheric Flight	Currently under review	Start of flight research program to demonstrate NASP technologies
X-30 First Orbital Flight	Currently under review	Demonstration of first single-stage-to-orbit vehicle

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FY 1994 RDT&E DESCRIPTIVE SUMMARY (U)

(U) Program Element: #0603270F

(U) Budget Activity: #2 - Advanced Technology Development

(U) PE Title: Electronic Combat TechnologyA. (U) RESOURCES BY PROJECT (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 92 Actual</u>	<u>FY 93 Estimate</u>	<u>FY 94 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2222 Expendable/Offboard Countermeasures	5,671	7,391	3,475	Cont	TBD
2432 Defensive System Fusion	3,062	3,894	2,540	Cont	TBD
2754 Suppression of Enemy Defenses	1,341	1,416	2,994	Cont	TBD
431G Threat Alert	12,486	10,736	8,130	Cont	TBD
691X On-board Countermeasures	<u>5,362</u>	<u>7,221</u>	<u>8,550</u>	<u>Cont</u>	<u>TBD</u>
<u>Total</u>	27,922	30,658	25,689	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Electronic Combat Technology program element is an ongoing advanced development program to expand the electronic warfare (EW) technology base to counter an ever increasing threat capability. To maintain the effectiveness of USAF EW systems against the advancing threat, a robust technology effort is required. This program provides design concepts and demonstrates technologies to support critical electronic combat requirements. The projects are categorized by the development of components, subsystems, and technologies that have potential application to satisfy combat, special operations and airlift EW requirements and to reduce acquisition and life cycle costs of EW systems. The program develops and demonstrates radio frequency (RF), infrared (IR), electro-optical (EO) and command, control, and communications (C3) countermeasure technologies; whenever practical, these are demonstrated as flyable brassboards against validated threat simulators. In addition, the program develops and demonstrates technologies and concepts for signature reduction, advanced EW transmitters, receivers, and power management. This program ensures a strong EW technology base to provide demonstrated counters to current and future threat capabilities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1.(U) Project 2222, Expendable Countermeasures: This project develops and demonstrates systems and components for infrared (IR), electro-optic (EO), laser, radio frequency (RF) and multispectral expendable countermeasure technologies. Improved antenna, transmitter, and multispectral and multi-technique offboard countermeasure technologies are developed and demonstrated.

(U) FY 1992 Accomplishments:

- (U) Completed fabrication of brassboard millimeter wave decoy and began laboratory demonstration.
- (U) Continued flare technology demonstration and testing.
- (U) Designed and developed smart chaff concept and plan for future flight demonstration.
- (U) Completed design and began development of dual IR/RF decoy concept.

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(U) Program Element: #0603270F
(U) PE Title: Electronic Combat Technology

(U) Budget Activity: #2 Advanced Technology Development

(U) FY 1993 Planned Program:

- (U) Complete demonstration of millimeter wave decoy against projected advanced missile threat.
- (U) Complete development and laboratory testing of a smart chaff concept for countering radar tracking systems.
- (U) Conduct field test demonstration and deliver units of a dual IR/RF decoy using aerodynamic flare and passive RF signature technology.

(U) FY 1994 Planned Program:

- (U) Complete field demonstration and begin flight demonstration of flare technology.
- (U) Begin development of design requirements for an advanced multicolor kinematic decoy.
- (U) Begin development of design requirements for an expendable to counter threat missiles incorporating advanced counter-countermeasures.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH manages this effort. Contractors include Lockheed-Sanders, Nashua, NH; Raytheon, Goleta, CA; and Tracor, Austin, TX.

(U) Related Activities:

- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) The Joint Director of Laboratories/Technical Panel on Electronic Warfare coordinates this effort with other services. This project has been coordinated through the Project Reliance process to harmonize efforts and to eliminate duplication.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2432 Defensive System Fusion: This project develops and demonstrates sensor and system fusion; integration; architecture, algorithm and assessment techniques; and hardware technologies. These technologies will cope with the projected multispectral threat and countermeasure environments for combat aircraft. This project develops advanced electronic combat algorithms and expert software for application on existing and future Electronic Combat systems. This project also conducts real time man-in-the-loop and hardware-in-the-loop integrated defensive avionics demonstrations.

(U) FY 1992 Accomplishments:

- (U) Developed system design for Advanced Defensive Avionics Response Strategy (ADARS) system to fuse onboard, offboard and data.
- (U) Extended data fusion techniques for correlation of signals.
- (U) Completed demonstration of transportability and reusability of Ada-coded EW functions and established library of Ada software modules.
- (U) Demonstrated radar warning receiver hardware in the loop, integrated with simulated mission software and processed in a real time, simulated threat environment.

(U) FY 1993 Planned Program:

- (U) Conduct initial ADARS demonstration and continue optimization of algorithms and software.
- (U) Conduct initial demonstration of sorting and identification hardware, algorithms and software modules.
- (U) Integrate real time mission simulation with to provide capability for defensive avionics fusion demonstration.

(U) FY 1994 Planned Program:

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(U) Program Element: #0603270F
(U) PE Title: Electronic Combat Technology

(U) Budget Activity: #2 Advanced Technology Development

- (U) Complete ADARS optimization of algorithms and software modules and conduct technical demonstrations.
- (U) Conduct demonstrations using the Integrated Defensive Avionics Laboratory (IDAL) to demonstrate benefits of integrating EW sensors for situation awareness and countermeasure response strategies.
- (U) Begin development of system requirements and conduct risk reduction for development of single sensor to fuse missile and laser warning functions.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: ITT, Nutley, NJ; Loral, Yonkers, NY; and Lockheed Sanders, Nashua, NH.

(U) Related Activities:

- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this effort with the other services. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 2754, Suppression of Enemy Defenses: This project develops and demonstrates C3CM, stand-off and support countermeasures technologies and techniques to deny, disrupt and suppress adversary air defense operations. This project provides advanced development of techniques and hardware for application to existing and new electronic warfare systems. The project includes the following areas: (1) simulation efforts for the evaluation of new concepts and techniques; (2) components and techniques needed to jam enemy radar; (3) electronic collection systems to inform the field commander of changes in the electronic environment; and (4) advanced stand-off jammer technology.

(U) FY 1992 Accomplishments:

- (U) Conducted analysis and evaluation of techniques to counter signals.
- (U) Demonstrated a system to develop deceptive countermeasure techniques against hostile signals.
- (U) Completed system requirements and mission area analyses for high power countermeasure (HPCM) host aircraft, and receiver/transmitter power requirements.

(U) FY 1993 Planned Program:

- (U) Complete hardware and software demonstration and delivery of a workstation for in-house development of deceptive countermeasure techniques against hostile signals.
- (U) Develop system requirements to demonstrate offboard wide area jamming system.
- (U) Conduct feasibility demonstration using laboratory demonstration model and begin design of brassboard hardware to counter signals.
- (U) Conduct threat and receiver architecture evaluation to design, develop and flight test brassboard to jam navigation systems.

(U) FY 1994 Planned Program:

- (U) Complete design, then fabricate, and begin lab testing of advanced development models for brassboard hardware to counter wide area signals.
- (U) Design and begin fabrication of flyable, demonstration hardware to jam threat navigation systems.
- (U) Begin design of a critical experiment to demonstrate techniques to counter multi-channel communication systems.

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(U) Program Element: #0603270F
(U) PE Title: Electronic Combat Technology

(U) Budget Activity: #2 Advanced Technology Development

- (U) Begin design of a high frequency (HF), airborne antenna system for use in jamming threat C³ systems.
- (U) Begin analysis for defining a hardware design to reduce the size and weight while improving the performance of a small platform RF jamming package.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: Raytheon, Goleta, CA; GTE, Mountain View, CA; and Calspan, Buffalo, NY, Questech Inc., VA and Georgia Institute of Technology, GA.

(U) Related Activities:

- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this effort with the other services. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: None.

4. (U) Project 431G, Threat Alert: This project develops and demonstrates advanced technologies for threat warning to enhance aircraft survivability and provide air crew situation awareness. Missile/aircraft warning, laser warning and RF receiver technologies are developed and demonstrated under this project. Advanced electronic combat preprocessor technologies, advanced sorting and preprocessing algorithms and expert software for applications on existing and future Electronic Combat systems are also developed and demonstrated.

(U) FY 1992 Accomplishments:

- (U) Designed and began development of hardware, algorithms (including random agile deinterleave (RAD) insertion) and software modules to improve radio frequency receiver sorting and identification.
- (U) Completed design and began development of hardware and algorithms to provide covert missile time-to-intercept for warning receivers.
- (U) Completed anechoic chamber testing of all-polarization brassboard antenna.
- (U) Developed requirements and system design for advanced high accuracy angle of arrival threat warning antenna.
- (U) Demonstrated advanced intrapulse preprocessor applications to RF receiver functions.
- (U) Conducted live fire flight test demonstration of scanning focal plane array sensor technology.

(U) FY 1993 Planned Program:

- (U) Complete design and begin fabrication of high sensitivity sensor to detect laser beam rider missiles.
- (U) Conduct flight tests to measure the IR signature of various missiles and begin analysis and correlation with model predictions.
- (U) Begin fabrication of high accuracy, single aperture antenna, to detect and measure angle of arrival of radar emitters.
- (U) Complete bench testing and integrated test bed (ITB) demonstration of advanced preprocessing prototype hardware and algorithms (including RAD insertion).
- (U) Complete laboratory testing and begin field testing of hardware and algorithms to provide covert missile time-to-intercept capability for warning receivers.
- (U) Begin analysis for developing requirements for techniques to detect IR targets in missile warning system clutter environment.

(U) FY 1994 Planned Program:

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(U) Program Element: #0603270F
(U) PE Title: Electronic Combat Technology

(U) Budget Activity: #2 Advanced Technology Development

- (U) Begin field and airborne tests to demonstrate the ability of active and passive approaches to covertly determine threat missile time-to-intercept.
- (U) Conducted a flight test with Canada of a miniaturized laser warning sensor (MINLAWS).
- (U) Complete analysis of missile IR signature flight test data and correlation with model predictions.
- (U) Complete the requirements definition and develop techniques to detect IR targets in missile warning system clutter environments.
- (U) Continue fabrication and begin laboratory demonstration of high sensitivity sensor to detect and warn of laser beam rider missiles.
- (U) Begin development of design requirements for Band III sensor to detect laser beam rider missiles.
- (U) Complete the integrated test bed (ITB) demonstration of advanced preprocessing prototype hardware and algorithms (including RAD insertion).
- (U) Begin analysis of requirements for an advanced RF receiver demonstration.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: AVW Electronics, Los Angeles, CA; Loral, Yonkers, NY; Hughes, Danbury, CT; Motorola, Phoenix, AZ; GE, Utica, NY; Texas Instrument, Dallas TX; Loral, Lexington, MA; Cincinnati Electronics, Cincinnati, OH; MERCER, Robins, GA; Litton Industries Inc., CA and Lockheed Sanders, Nashua, NH.

(U) Related Activities:

- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this effort with the other services. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

5. (U) Project 691X Onboard Countermeasures: This project develops, and demonstrates infrared (IR), electro-optic (EO), laser and radio frequency (RF) countermeasure technologies. The technologies will be investigated for onboard application to combat aircraft.

(U) FY 1992 Accomplishments:

- (U) Set up experiments to compare
- (U) Conducted critical design review of brassboard EO (IR emphasis) smart skin technology and begin fabrication.
- (U) Began analysis and modeling of turbulence interactions to predict propagation of laser beams through engine exhaust plume, and aircraft turbulent wake.
- (U) Coordinated with DARPA for design and development of a laser for a future Infrared Countermeasure (IRCM) system that will have wavelengths in the 2-3 micron, 3-5 micron and 8-12 micron wavelength regions. Emphasized packaging for airborne applications.

(U) FY 1993 Planned Program:

- (U) Demonstrate laser rangefinder countermeasures in cooperation with British government.
- (U) Perform live-fire testing of
- (U) Begin detailed design, fabrication and evaluation of a ground testable demonstration model for laser beamrider countermeasure techniques.
- (U) Design and conduct validation experiments for the Turbulence Interaction Model to produce laser transmission measurement database to support laser application for electro-optical countermeasures.

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(U) Program Element: #0603270F
(U) PE Title: Electronic Combat Technology

(U) Budget Activity: #2 Advanced Technology Development

- (U) Complete critical design review for experimental hardware to produce a wide range of turbulent conditions found behind aircraft.
- (U) Complete demonstrations of low band advanced solid state transmitter.
- (U) Continue experiments to compare
- (U) Investigate and evaluate three monopulse electronic countermeasure (ECM) techniques that utilize a single shared aperture.
- (U) Begin design of countermeasure system, employing fiber optics, to counter laser trackers, designators and rangefinders.

(U) FY 1994 Planned Program:

- (U) Complete initial laser experiments to compare
- (U) Continue developing infrared countermeasure system acquisition experiments and begin a field demonstration for evaluation of techniques.
- (U) Begin development of designs to upgrade the Dynamic Infrared Missile Evaluator (DIME) lab to test and demonstrate advanced infrared countermeasure techniques.
- (U) Conduct experiments of the Turbulence Interaction Model which will be used to support development of laser applications for electro-optical countermeasures.
- (U) Complete design and begin fabrication of a countermeasure system, employing fiber optics, to counter laser trackers, designators and rangefinders.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH, manages this project. Contractors include: Loral Defensive Systems, Akron, OH; Loral Nutronics, Newport Beach, CA; Raytheon, Goleta, CA; Hughes, Danbury, CT; SAIC, Dayton, OH; Lockheed Sanders, Nashua, NH and Martin Marietta Corp., CO.

(U) RELATED ACTIVITIES:

- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) Program Element 0603203F, Avionics for Aerospace Vehicles.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this project with the other services. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements:

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603302F
PE Title: Space and Missile
Rocket Propulsion

Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
6340 Space Systems Propulsion Technology	5,733	9,751	6,693	Cont	TBD
6341 Missile Systems Propulsion Technology	<u>1,025</u>	<u>2,889</u>	<u>3,334</u>	<u>Cont</u>	<u>TBD</u>
Total	6,758	12,640	10,027	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology (S&T) program demonstrates advanced rocket propulsion technology. This program is the key technology step to transition the most promising rocket propulsion technologies developed in Rocket Propulsion and Astronautics Technology (PE 0602302F) and demonstrates them in applications using full-scale, proof-of-principle demonstrations. Solid propellant technology with higher performance than current propellants and environmentally acceptable exhaust products, manufactured using environmentally sensitive processes, is under development. Technology which will reduce the manufacturing cost of nozzles by 20 percent is also under development. Anticipated technology advances in this program are a 100 percent increase in payload capability from low earth orbit (LEO) to geosynchronous earth orbit (GEO), a \$100 million savings in space launch, and liquid engines which can be used 50 times before being rebuilt. Technologies demonstrated under this program may be applied to all DoD and NASA propulsion needs. The propulsion industry also leverages the technologies from this program to enhance the country's rocket propulsion industry competitiveness.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 6340, Space Systems Propulsion Technology: This project develops and demonstrates advanced and innovative storable liquid, cryogenic liquid, and electric arcjet propulsion systems for current and future national space systems. Launch vehicle, orbit maneuvering and transfer, and satellite station keeping applications are the focus of the technology developed under this project. The emphasis is on space propulsion system reliability, reusability, reduced weight, reduced operation and launch costs, and increased life and performance.

(U) FY 1992 Accomplishments:

- (U) Demonstrated one of two candidate XLR-132 engines under conditions which simulate orbit transfer missions from low earth to high earth orbit.
- (U) Fabricated and ground-tested an end-to-end arcjet propulsion system to verify performance and reliability of components.

(U) FY 1993 Planned Program:

- (U) Conduct critical design review of a 30 kilowatt arcjet propulsion system.
- (U) Complete preliminary design and analysis of a ten kilowatt electric propulsion system.
- (U) Perform final series of ground tests in a vacuum chamber to flight-qualify a 30 kilowatt arcjet propulsion system.

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Program Element: #0603302F
PE Title: Space and Missile
Rocket Propulsion

Budget Activity: #2 - Advanced Technology
Development

- (U) Evaluate design of the ten kilowatt electric propulsion system components through a series of bench-scale tests.
- (U) Complete XLR-132 engine testing.
- (U) FY 1994 Planned Program:
 - (U) Fabricate a 30 kilowatt electric propulsion flight unit for FY 1995 flight test.
 - (U) Begin acquiring electric propulsion subsystem and instrumentation package components for an electric propulsion demonstration.
 - (U) Conduct critical design review of a ten kilowatt electric propulsion system.
 - (U) Begin integration and testing of an electric propulsion subsystem and instrumentation package components for an electric propulsion demonstration.
 - (U) Begin advanced turbopump development.
- (U) Work Performed By: Managed by the Phillips Laboratory Propulsion Directorate, Edwards AFB, CA. The major contractors are: Aerojet Propulsion, Sacramento, CA; Rockwell Rocketdyne, Canoga Park, CA; and TRW Missile Systems, Redondo Beach, CA.
- (U) Related Activities:
 - (U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
 - (U) PE 0603401F, Advanced Spacecraft Technology.
 - (U) PE 0603402F, Space Test Program (STP).
 - (U) PE 0305171F, Space Shuttle Operations (Upper Stages).
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 6341, Missile Systems Propulsion Technology: This project develops innovative and advanced solid propulsion systems for tactical and ballistic missile applications. The emphasis of this project is environmental acceptability, as well as reducing the development and fabrication costs of future missile propulsion systems and increasing the reliability and life of these systems. The technologies developed under this project are applied to Air Force and Navy missiles. Technologies developed under this project may also be applied to solid propulsion space launch vehicles including boosters and orbit transfer vehicles.
- (U) FY 1992 Accomplishments:
 - (U) Performed ground test firings under simulated altitude conditions to demonstrate capability of integrated stage technology.
 - (U) Evaluated advanced propellants for solid rocket motors.
- (U) FY 1993 Planned Program:
 - (U) Fabricate advanced booster nozzle components for bench-scale testing to evaluate designs.
 - (U) Evaluate design integrity of booster components including a conical composite case in a series of bench-scale tests.
 - (U) Update advanced booster design using component tests.
 - (U) Develop preliminary design of an advanced booster demonstration motor.
 - (U) Identify the missile environmental compliant processes for component manufacturing.

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Program Element: #0603302F
PE Title: Space and Missile
Rocket Propulsion

Budget Activity: #2 - Advanced Technology
Development

- (U) FY 1994 Planned Program:
 - (U) Conduct testing on subscale bond liners, nozzles, and missile cases.
 - (U) Select a potential high energy, environmentally acceptable propellant for scale-up and full-scale demonstration.
 - (U) Evaluate components in deployed missiles for potential technology insertion opportunities to improve reliability and service life.
- (U) Work Performed By: Managed by the Phillips Laboratory Propulsion Directorate, Edwards AFB, CA. The only contractor is Aerojet Propulsion, Sacramento, CA.
- (U) Related Activities:
 - (U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable

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Program Element: #0603307F
PE Title: Air Base Operability
Advanced Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
3018 Air Base Operability	<u>3.315</u>	<u>3.520</u>	<u>3.739</u>	CONT	TBD
Total	3,315	3,520	3,739	CONT	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Air Base Operability (ABO) integrates operational concepts with research, development, and acquisition programs to improve a sustained sortie generation capability should an attack occur on or close to an air base. The Air Force must provide people, aircraft, facilities, and key supporting systems so that theater air bases can continue to operate following enemy attacks allowing air power to be continuously and effectively employed throughout the conflict.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3018 Air Base Operability (ABO):

Provides Advanced Development efforts for active and passive defense, air base survivability, base recovery, and sortie generation. It also funds the continuing integration, planning, and technology demonstration activities of the ABO Systems Management Office (SMO). The SMO is responsible for integrating all ABO activities Air Force wide and performing cost effectiveness analyses on ABO requirements and programs for meeting them.

(U) FY 1992 Accomplishments:

- (U) Conducted aircraft shelter validation tests of hardening through upgrading and retrofitting and the effect on sortie generation.
- (U) Conducted Explosive Hazard Reduction (EHR) Site Surveys.
- (U) Provided pre-design subsystems for the Mobile Ordnance Disrupter System (MODS).
- (U) Awarded Dem/Val contract for the design, test, and mfg of a near form, fit, and function MODS.
- (U) Conducted lab, field, and validation testing of the Survivability of Structures on Piles.
- (U) Completed and published a smoke/obscurants employment manual.
- (U) Conducted Technology Demonstration of Explosive Ordnance Disposal (EOD) Mini FLAIL.
- (U) Completed Dem/Val of an F-15 A/C Decoy.

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Program Element: #0603307F
PE Title: Air Base Operability
Advanced Development

Budget Activity: #4 - Tactical Programs

(U) FY 1993 Planned Program:

- (U) Proceed to design and integrate subsystems for demonstration of the MODS.
- (U) Conduct full scale mitigation validation testing for Structures on Piles vulnerabilities. Continue damage phenomenology modeling analysis.
- (U) Award a Dem/Val contract for a minefield clearance system.

(U) FY 1994 PLANNED PROGRAM:

- (U) Continue the Dem/Val of a minefield clearance system.
- (U) Begin Dem/Val for the classified CCD Fade-Out, Fuzz Buster, Black Hole and Laser Warning/FLIR Defeat programs.
- (U) Complete Dem/Val of Vertical smoke and obscurants.
- (U) Complete Dem/Val of Multispectral Nets.
- (U) Initiate Dem/Val of Armored Multi-Role Vehicle (ARMRV) program.
- (U) Finalize Mitigation validation of design guidance for Structures on Piles.
- (U) Complete and validate an analysis of shelter hardening on sortie generation through A/C shelter upgrade program.

(U) Work performed By: Sparta, Inc., Huntsville, AL; and Sverdrup Technology, Eglin AFB, FL. In-house development by Aeronautical Systems Center and Armstrong Laboratory, Wright-Patterson AFB, OH; Air Force Civil Engineering Services Agency, Tyndall AFB, FL; Electronic System Center, Hanscom AFB, MA; Air Force Weapons Laboratory and Phillips Laboratory, Kirtland AFB, NM; and Aeronautical Systems Center, Eglin AFB, FL.

(U) Related Activities:

- (U) The Project in this element transitions to engineering and manufacturing development in Program Element 0604617F Air Base Operability.

(U) Other Appropriation Funds (\$ in Thousands):
Not Applicable.

(U) International Cooperative Agreements:
Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603311F
 PE Title: Ballistic Missile
Technology (BMT)

Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
4091 Missile Electronics	46,143	54,036	58,080	Cont	TBD
4092 Reentry Vehicle Technology	5,416	3,487	900	Cont	TBD
4093 Propulsion and Booster Technology	1,838	1,688	0	0	3,628
4094 Survivability/Endurability Technology	296	0	0	0	296
4095 Technology Integration and Demonstration	5,486	0	0	0	22,117
Total	59,179	59,211	58,980	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates ballistic missile technologies in the areas of guidance and control and reentry vehicles for existing and future intercontinental ballistic missile (ICBM) systems and subsystems. The end of the Cold War, decline in the Soviet threat, and strong interest in precision strike missions for global reach and global strike have resulted in considerable reorientation of this Program Element. Near-term emphasis is on technologies which provide low-cost, low-maintenance, increased reliability, and increased performance and survivability for the currently deployed ICBM fleet, enabling it to continue operations well beyond the original design life. Demonstration of integrated technologies is essential to verify real world benefits/payoffs of the integrated system and to reduce technology transition risk. Through BMT, the Air Force coordinates ICBM research and development in various laboratories, performs technology trade offs, develops new hardware, and conducts ground and flight testing. A vigorous BMT program maintains technological superiority, thereby, maintaining U.S. "R&D Deterrent" and a flexible ICBM force for different U.S. security options within a changing global environment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 4092, Reentry Vehicle Technology: This project develops reentry phenomenology technology, global range precision strike technologies, and technologies for penetration of a reentry vehicle through enemy defenses. Reentry phenomenology technology involves understanding the ionized plasma sheath around a reentry vehicle, ablative material needs, and aerodynamic performance characteristics. Global range precision strike technologies include low-cost precision guidance, materials, and vehicle performance over extended aerodynamic glide trajectories. Defense penetration technology is a low level effort to analyze penetration tactics and options for defeating current and projected antiballistic missile threats.

(U) FY 1992 Accomplishments:

- (U) Completed the High Performance Maneuvering Reentry Vehicle Phase 1 program initiated in FY 1991 to define technology options for test vehicle configurations.
- (U) Flight tested the pyrotechnic technology experiment and conducted post-flight data analysis.

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Program Element: #0603311F
PE Title: Ballistic Missile
Technology (BMT)

Budget Activity: #2 - Advanced Technology
Development

(U) FY 1993 Planned Program:

- (U) Conduct analysis and engineering design trades to identify key technology challenges for alternative uses of ballistic missiles.
- (U) Complete pyrotechnic flight test analysis.

(U) FY 1994 Planned Program:

- (U) Conduct ground tests to evaluate the feasibility of receiving Global Positioning System signals through reentry plasma.
- (U) Update computer models to improve ability to affordably experiment with reentry vehicle flow fields and designs.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM, is the responsible technical activity. Major contractors include: Aerotherm Corp., Mountain View, CA; Sparta, San Bernardino, CA; General Electric Aerospace, Valley Forge, PA; Hypersonics, Sunnyvale, CA; Lockheed Missiles and Space Company, Sunnyvale, CA; Orbital Sciences Corp., Tempe, AZ; Southern Research Institute, Birmingham, AL; Science Applications International, Fort Washington, PA; Kontech, Los Angeles, CA; Ultramet, Los Angeles, CA; Physical Sciences, Andover, MA; and TRW/Ballistic Missiles Division, San Bernardino, CA (Systems Engineering/Technical Assistance).

(U) Related Activities:

- (U) PE 0602101F, Geophysics.
- (U) PE 0602102F, Materials.
- (U) PE 0602201F, Flight Dynamics.
- (U) PE 0602203F, Aerospace Propulsion and Power.
- (U) PE 0602204F, Aerospace Avionics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4093, Propulsion and Booster Technology: This project integrates missile and propulsion technologies for existing and future intercontinental ballistic missiles (ICBMs) to optimize systems performance. It will demonstrate rocket propulsion technologies to extend performance, enhance producibility, increase reliability, and lower cost of advanced ICBMs. In the near future, it will: (a) support the high priority Minuteman life extension; and (b) demonstrate rocket propulsion technologies to extend performance, enhance producibility, increase reliability, and lower life cycle costs of ICBMs.

(U) FY 1992 Accomplishments:

- (U) Test fired an existing 37-inch scale motor to demonstrate, in a large motor, an environmentally acceptable propellant with suitable mechanical and ballistic properties for use in the repour/remanufacture of ballistic missiles.
- (U) Tested gas sampling techniques to analyze air pollutants in solid rocket motor plumes.

(U) FY 1993 Planned Program:

- (U) Formulate and conduct sub-scale tests on a more energetic, environmentally safe, reduced hydrochloric acid emitting propellant which approaches the performance levels of current ballistic missile formulations.

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Program Element: #0603311F
PE Title: Ballistic Missile
Technology (BMT)

Budget Activity: #2 - Advanced Technology
Development

- (U) Manufacture and test second 37-inch motor using the more energetic, clean propellant formulation, demonstrating a scale-up capability, and establish the performance baseline in operational class rocket motors.
- (U) FY 1994 Planned Program:
 - (U) Content of project transferred to PE 0603302F, Space and Missile Rocket Propulsion.
- (U) Work Performed By: The responsible agency is the Phillips Laboratory, Kirtland AFB, NM. Major contractors include: Thiokol Corporation, Brigham City, UT; Hercules Inc., Magna, UT; Aerojet Propulsion Company, Sacramento, CA; Chemical Systems Division, San Jose, CA; Atlantic Research Corporation, Gainesville, VA; and Rockwell/Rocketdyne Division, Canoga Park, CA.
- (U) Related Activities:
 - (U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
 - (U) PE 0603302F, Space and Missile Rocket Propulsion.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 4094, Survivability/Endurability Technology: This technology improves the survivability, reliability, endurability, and maintainability of existing and future intercontinental ballistic missile (ICBM) systems/subsystems. This project includes basing technology to increase hardness and enhance endurance. This project will address survivable communications needs and supporting technologies for ICBMs.
 - (U) FY 1992 Accomplishments:
 - (U) Analyzed ICBM communications requirements and threats.
 - (U) FY 1993 Planned Program: Not Applicable.
 - (U) FY 1994 Planned Program: Not Applicable.
- (U) Work Performed By: The responsible agency is the Phillips Laboratory, Kirtland AFB, NM. Basing contractors include: SAIC, LaJolla, CA; and Boeing, Redmond, WA. Command, Control, and Communications (C³) contractors include: GTE, Westboro, MA; and Loral, Philadelphia, PA.
- (U) Related Activities:
 - (U) PE 0602702F, C³.
 - (U) PE 0602203F, Aerospace Propulsion.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 4. (U) Project 4095, Technology Integration and Demonstration: This project integrates and flight validates technologies developed in the BMT program and will provide demonstrated technology options for existing and future ICBM systems.

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Program Element: #0603311F
PE Title: Ballistic Missile
Technology (BMT)

Budget Activity: #2 - Advanced Technology
Development

(U) FY 1992 Accomplishments:

- (U) Flight tested full-scale (modified Mk 12) and decoy-sized pyrotechnic carrier vehicles in a combined missile flight test demonstrating an integrated optical penetration aid concept.
- (U) Began analysis of Pyrotechnic flight test results.
- (U) Initiated design of BMT flight test payloads and vehicle.

(U) FY 1993 Planned Program:

- (U) Project terminated.
- (U) Pyrotechnic flight test analysis transferred to Project 4092.
- (U) Design of BMT flight test payloads and vehicles transferred to Project 4092.

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: The responsible agency is the Phillips Laboratory, Kirtland AFB, NM. Major ICBM systems contractors include: McDonnell Douglas SSC, Huntington Beach, CA; Rockwell International/Autonetics SSD, Anaheim, CA; and Boeing, Redmond, WA.

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
- (U) PE 0602102F, Materials.
- (U) PE 0601102F, Defense Research Sciences.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603311F Project Number: 4091
PE Title: Ballistic Missile Technology (BMT) Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
Missile Electronics	46,143	54,036	58,080	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The current focus of the Missile Electronics project is to develop and demonstrate technologies to support advanced guidance which maintains present day accuracies while dramatically reducing acquisition and support costs for existing and future intercontinental ballistic missiles (ICBMs). BMT guidance technology projects focus on two efforts. The Advanced Inertial Measurement System (AIMS) will demonstrate technologies for an affordable replacement inertial measurement unit for Minuteman III. AIMS will demonstrate low-cost guidance components based on ring-laser gyro technology and advanced stellar update mechanization. The second focus is the Global Positioning System (GPS) Guidance Package (GGP) project to develop low-cost accurate terminal guidance for a variety of military and civilian applications. This project will develop and flight test units which incorporate fiber optic gyro and miniature accelerometer technologies; integrated with GPS for flight testing in FY 1996.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed ground and dormancy testing of the Advanced Inertial Measurement Unit (AIMU).
- (U) Continued the AIMS program to design, fabricate, integrate, and ground test technology for low-cost guidance with solid state instruments.
- (U) Completed study of integrated boost-through-reentry guidance for ICBMs.
- (U) Completed design review 1 for the GGP Phase 1 program.

2. (U) FY 1993 Planned Program:

- (U) Complete fabrication and performance testing of AIMS test units and begin fabrication of flight quality units for FY 1994 delivery and test.
- (U) Leverage continued competitive design and development of GGP brassboard flight test units.

3. (U) FY 1994 Planned Program:

- (U) Complete fabrication of AIMS flight test units and begin preparation for FY 1995 sled testing.
- (U) Complete GGP test units and initiate ground testing of test units.
- (U) Initiate integration of GGP flight units into existing flight proven test vehicle.
- (U) Initiate design of continuous positive control and command destruct communications from launch to impact for flight test range safety and operational mission control/destruction capability.
- (U) Initiate GGP Phase II program to improve the accuracy of the inertial instruments, miniaturize the GGP package, and reduce the power requirements.

4. (U) Program to Completion: This is a continuing program.

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Program Element: #0603311F
PE Title: Ballistic Missile
Technology (BMT)

Project Number: 4091
Budget Activity: #2 - Advanced Technology
Development

D. (U) WORK PERFORMED BY: The responsible agency is the Phillips Laboratory, Kirtland AFB, NM. Major contractors include: General Electric Aerospace, Pittsfield, MA; Litton Guidance and Control Systems, Woodland Hills, CA; Honeywell Inc., Clearwater, FL; C.S. Draper Laboratory, Cambridge, MA; Rockwell International, Autonetics Division, Anaheim, CA; and Northrop Corp., Hawthorne, CA. Technical execution of the Advanced Inertial Measurement System (AIMS) program will reside at the Ballistic Missile Organization, Norton AFB, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Combat Air Forces Mission Need Statement 356-92, Future Guidance Systems for Intercontinental Ballistic Missiles, dated 20 October 1992.
- (U) Air Force Logistics Command Statement Of Need 001-90, Improved Reliability/Maintainability Advanced Guidance Systems for Intercontinental Ballistic Missiles, dated 23 February 1990.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602204F, Aerospace Avionics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|---|----------------|
| 1. (U) AIMS interim design review #1 | February 1992 |
| 2. (U) Advanced Inertial Measurement Unit ground testing completed | September 1992 |
| 3. (U) AIMS interim design review #2 | January 1993 |
| 4. (U) Global Positioning System Guidance Package flight test units delivered | November 1994 |
| 5. (U) Complete AIMS final design review | June 1995 |
| 6. (U) Complete AIMS advanced technology demonstration | June 1995 |
| 7. (U) AIMS hardware delivery | December 1995 |
| 8. (U) Global Positioning System Inertial Measurement Unit flight test | September 1996 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603319F
 PE Title: Airborne Theater
Defense Technologies

Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
4269 Airborne Laser Demonstration	0	0	3,845	Cont	TBD
Total	0	0	3,845	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology (S&T) program element (PE) will develop and demonstrate the technologies required for airborne theater defense. The current project will demonstrate an Airborne Laser (ABL) for defeating theater ballistic missiles in the boost phase. An ABL as a tier of the overall theater missile defense architecture would destroy theater missiles during boost phase causing the missile/warhead to be destroyed or fall well short of the intended target, probably over enemy territory. The ABL demonstrator will have a weapon range greater than 200 kilometers, be in-flight refuelable, and nominally require one to five seconds to kill a theater ballistic missile above the weather during boost phase.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

(U) Project 4280, Airborne Laser Demonstration: This project is comprised of the up-front conceptual design of the technology demonstrator based on the Air Force need for a weapon to destroy theater ballistic missiles during boost phase. The project will then proceed with the detailed design, fabrication, and demonstration of a high-power ABL coupled with other necessary subsystems such as target acquisition pointing and tracking. The ABL technology demonstrator will be built to provide an operationally realistic technology and lethality demonstration, including sufficient target acquisition and lethal range. Critical decision points are a part of the planned program. Other S&T PEs will provide the enabling technologies and the risk reduction activities.

(U) FY 1992 Accomplishments: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Initiate design of airframe modifications, as well as the related hardware and software, necessary to install and support the high energy laser and related subsystems into an existing aircraft platform.
- (U) Initiate design of a high-power laser including fuel handling or power generation subsystems and resonator optical benches/components.
- (U) Initiate design of a laser beam control subsystem to irradiate target with lethal energy density.
- (U) Initiate design of avionics, battle management, and fire control components.
- (U) Begin developing analytical models/computer codes to predict the performance of the demonstrator to include the aircraft, weapons, and command and control elements.

(U) Work Performed By: This project will be managed by the Phillips Laboratory, Kirtland AFB, NM. This is a new start.

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Program Element: #0603319F
PE Title: Airborne Theater
Defense Technologies

Budget Activity: #2 - Advanced Technology
Development

(U) Related Activities:

(U) PE 0602601F, Advanced Weapons.

(U) PE 0603605F, Advanced Weapons Technology.

(U) PE 0603217C, Follow-on Systems.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F
PE Title: Advanced Spacecraft Technology

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2181 Advanced Space Electronics and Software Technology	9,489	12,067	11,803	Cont	TBD
3784 Advanced Space Communications and Sensor Technology	1,351	1,222	3,184	Cont	TBD
3834 Advanced Spacecraft Technology Integration	1,139	6,550	4,858	Cont	TBD
3977 Thermionic Space Power	9,584	4,106	0*	*	TBD
682J Advanced Space Power Technology	1,898	3,176	4,430*	Cont	TBD
Total	23,461	27,121	24,275	Cont	TBD

*In FY 1994, Project 3977, Thermionic Space Power, will be terminated and the technical content moved into Project 682J, Advanced Space Power Technology.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element (PE) develops and demonstrates advanced spacecraft technologies in integrated space flight and ground experiments. These experiments will decrease the required transition time for innovative spacecraft technologies and reduce the associated development risks and costs. Efforts are focused on four high payoff areas: advanced space-qualifiable microelectronics; affordable high quality space applications software; assured, secure space sensors and communications; and compact, affordable, and survivable space power conversion, conditioning, and storage. This PE will supply the space-unique software and computer systems hardware technology for future satellite programs. This PE also investigates advanced spacecraft flight dynamics. Beginning in FY 1994, this effort will assess low-cost adverse-weather sensor and related structures, and processing technologies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3784, Advanced Space Communications and Sensor Technology: This project develops and demonstrates Super High Frequency (SHF), Extremely High Frequency (EHF), and other advanced space communications and sensor technologies. The primary focus of the project is in EHF (60 gigahertz (GHz)) satellite-to-satellite communications to enhance constellation survivability and decrease dependency on multiple/overseas ground stations. The thrust of the technology program is improved affordability, reliability, and performance as well as a five times reduction in communications/sensors payload size, weight, and power requirements.

(U) FY 1992 Accomplishments:

- (U) Developed a 44 GHz receiver for interference mitigation in satellite communications.

(U) FY 1993 Planned Program:

- (U) Develop and test a low noise amplifier for satellite communications.
- (U) Investigate a 60 GHz diplexer, crosslink antenna, traveling wave tube amplifier, and mixer for satellite communications.

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Program Element: #0603401F
PE Title: Advanced Spacecraft
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) FY 1994 Planned Program:
 - (U) Demonstrate technologies for a high gain Super High Frequency transmitting antenna.
 - (U) Begin developing a 60 gigahertz (GHz) receiver for crosslinking satellites.
 - (U) Complete development of the 60 GHz travelling wave tube amplifier.
 - (U) Begin development of the control interface for a 60 GHz satellite-to-satellite communication crosslink.
 - (U) Evaluate the utility of advanced sensor technologies for application to space surveillance.
- (U) Work Performed By: Managed by the Phillips Laboratory's Space and Missiles Technology Directorate, Space Sensors Division, Kirtland AFB, NM. Contractors are: General Electric, Valley Forge, PA, and Syracuse, NY; Chang Industries, LaVerne, CA; RDL, Culver City, CA; MPB Technologies, Pointe Claire, Quebec, Canada; MIT-Lincoln Laboratories, Lexington, MA; and RDL, Culver City, CA.
- (U) Related Activities:
 - (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
 - (U) PE 0604711F, Extremely High Frequency Satellite Communications Research and Development.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 3834, Advanced Spacecraft Technology Integration: This project integrates maturing technologies into space vehicles to demonstrate their practicality and to respond to space system user needs. Demonstrations presently being conducted are the Technology for the Autonomous Operational Survivability (TAOS) and a demonstration of an electric propulsion system on a satellite. The latter is jointly funded by Program Element 0603302F, which provides the propulsion technology. The TAOS program is a satellite autonomy and survivability demonstration. TAOS subsystems are being integrated into a small spacecraft and will be placed into a low earth orbit for 12 months. TAOS will demonstrate and validate advanced spaceborne computers, autonomous navigation hardware and software, laser sensors, radar sensors, advanced data buses, and various spacecraft operational concepts. The electric propulsion demonstration will demonstrate the feasibility of a fully integrated electric orbital maneuvering system (EOMS). An EOMS provides faster and more fuel efficient repositioning of on-orbit assets and the ability to launch payloads with smaller rockets. Cooperative development of this dual-use technology with industry will increase U.S. competitiveness in global markets. The electric propulsion demonstration includes: an arcjet propulsion subsystem; a high-output solar power subsystem; and an autonomous Guidance, Navigation, and Control (GN&C) package.
- (U) FY 1992 Accomplishments:
 - (U) Completed TAOS payload integration.
 - (U) Established the interface control documents between the Technology for the TAOS spacecraft and the major subsystems.

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Program Element: #0603401F
PE Title: Advanced Spacecraft
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) Conducted pre-launch and on-orbit Autonomous Operational Survivability (TAOS) payload mission analysis.
- (U) FY 1993 Planned Program:
 - (U) Integrate the Payload Data Panel onto the TAOS Space Test Experiments Spacecraft Bus.
 - (U) Complete integration of the TAOS-unique ground support hardware and software.
 - (U) Following launch of the TAOS satellite into orbit, conduct autonomous survivability demonstrations.
 - (U) Determine if a space surveillance sensor/processor should be integrated with the electric propulsion demonstration.
- (U) FY 1994 Planned Program:
 - (U) Complete TAOS flight demonstration.
 - (U) Conduct TAOS post-mission analysis.
 - (U) Initiate detailed design of Guidance, Navigation, and Control package, sensors, and diagnostics for the electric propulsion demonstration spacecraft.
 - (U) Conduct mission operations planning for the electric propulsion demonstration spacecraft.
- (U) Work Performed By: Managed by the Phillips Laboratory's Space Experiments Directorate, Kirtland AFB, NM. Contractors are: TRW, Military Space Systems Division, Redondo Beach, CA; Microcosm, Torrance, CA; Rockwell, Anaheim, CA; Honeywell, Phoenix, AZ; GTE, Mountain View, CA; and I³C, Foster City, CA.
- (U) Related Activities:
 - (U) PE 0603302F, Space and Missile Rocket Propulsion.
 - (U) PE 0603438F, Satellite Systems Survivability.
 - (U) PE 0604609F, Reliability and Maintainability for Technology Insertion Program (RAMTIP).
 - (U) PE 0603218C, Survivability Technologies.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 3977, Thermionic Space Power: This project develops and demonstrates the non-nuclear technologies such as power conversion, conditioning, and thermal management that are associated with space nuclear power systems. It investigates alternatives to increase power subsystem performance, lifetime, survivability, and safety while reducing costs. It will also help define future technology and reactor objectives and guide Department of Energy space nuclear power programs which support Air Force needs. This project will be terminated in FY 1994 and the technical content moved into Project 682J, Advanced Space Power Technology.
 - (U) FY 1992 Accomplishments:
 - (U) Built and tested a thermionic heat pipe module.
 - (U) Conducted converter evaluation of new thermionic element emitter materials.
 - (U) Tested materials for the thermionic element emitter and collector, electrical insulators, and connectors.
 - (U) Planned a flight experiment for a thermionic heat pipe module.

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Program Element: #0603401F
PE Title: Advanced Spacecraft
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) Identified issues and payoffs for integrating thermionic power into satellites.
- (U) FY 1993 Planned Program:
 - (U) Define flight experiment integration and testing requirements for the liquid metal heat pipe.
 - (U) Perform liquid metal heat pipe laboratory ground testing.
 - (U) Begin life testing on the thermionic heat pipe module.
 - (U) Fabricate a single crystal emitter.
 - (U) Start hybrid thermionic power and propulsion concept design.
- (U) FY 1994 Planned Program: Not Applicable.
- (U) Work Performed By: Managed by the Phillips Laboratory's Space and Missiles Directorate, Kirtland AFB, NM. The top five contractors are: GA Technologies, San Diego, CA; Rockwell International, Canoga Park, CA; Space Power Inc., San Jose, CA; Orion International, Albuquerque NM; and Auburn University, Auburn, AL.
- (U) Related Activities:
 - (U) PE 0602203F, Aerospace Propulsion.
 - (U) PE 0603217C, Follow-On Systems.
 - (U) SP-100 Space Nuclear Power project by DOE, NASA, and SDIO.
 - (U) Thermionic Fuel Element Verification by DOE and SDIO.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 4. (U) Project 682J, Advanced Space Power Technology: This project demonstrates compact, survivable, satellite power generation, storage, and processing systems. Power generation work is focused on lightweight, low-cost, and moderately survivable solar arrays. Energy storage work is focused on demonstrating lightweight Nickel Hydrogen (NiH₂) and Sodium Sulfur (NaS) spacecraft batteries for five to ten year satellite missions. NiH₂ batteries are half the mass of existing satellite batteries and the ongoing life test will demonstrate a five year low earth orbit (LEO) life capability. Power processing efforts focus on producing lightweight, high efficiency, standardized subsystem designs for use on future high power, more survivable Air Force satellites. This project also develops and demonstrates non-nuclear technologies such as power conversion, conditioning, and thermal management that are associated with space nuclear power systems. It investigates alternatives to increase power subsystem performance, lifetime, survivability, and safety while reducing costs. It will also help define future technology and reactor objectives and guide Department of Energy space nuclear power programs which support Air Force needs such as space-based surveillance satellites, electric orbit transfer capability, advanced meteorological satellites, and future early warning systems.
- (U) FY 1992 Accomplishments:
 - (U) Obtained five year life test data on NiH₂ batteries in a LEO experiment.
 - (U) Developed an approach to insert advanced solar cells into arrays.

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Program Element: #0603401F
PE Title: Advanced Spacecraft
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) Identified issues and payoffs for integrating thermionic power into satellites.
- (U) FY 1993 Planned Program:
 - (U) Define flight experiment integration and testing requirements for the liquid metal heat pipe.
 - (U) Perform liquid metal heat pipe laboratory ground testing.
 - (U) Begin life testing on the thermionic heat pipe module.
 - (U) Fabricate a single crystal emitter.
 - (U) Start hybrid thermionic power and propulsion concept design.
- (U) FY 1994 Planned Program: Not Applicable.
- (U) Work Performed By: Managed by the Phillips Laboratory's Space and Missiles Directorate, Kirtland AFB, NM. The top five contractors are: GA Technologies, San Diego, CA; Rockwell International, Canoga Park, CA; Space Power Inc., San Jose, CA; Orion International, Albuquerque NM; and Auburn University, Auburn, AL.
- (U) Related Activities:
 - (U) PE 0602203F, Aerospace Propulsion.
 - (U) PE 0603217C, Follow-On Systems.
 - (U) SP-100 Space Nuclear Power project by DOE, NASA, and SDIO.
 - (U) Thermionic Fuel Element Verification by DOE and SDIO.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 4. (U) Project 682J, Advanced Space Power Technology: This project demonstrates compact, survivable, satellite power generation, storage, and processing systems. Power generation work is focused on lightweight, low-cost, and moderately survivable solar arrays. Energy storage work is focused on demonstrating lightweight Nickel Hydrogen (NiH₂) and Sodium Sulfur (NaS) spacecraft batteries for five to ten year satellite missions. NiH₂ batteries are half the mass of existing satellite batteries and the ongoing life test will demonstrate a five year low earth orbit (LEO) life capability. Power processing efforts focus on producing lightweight, high efficiency, standardized subsystem designs for use on future high power, more survivable Air Force satellites. This project also develops and demonstrates non-nuclear technologies such as power conversion, conditioning, and thermal management that are associated with space nuclear power systems. It investigates alternatives to increase power subsystem performance, lifetime, survivability, and safety while reducing costs. It will also help define future technology and reactor objectives and guide Department of Energy space nuclear power programs which support Air Force needs such as space-based surveillance satellites, electric orbit transfer capability, advanced meteorological satellites, and future early warning systems.
- (U) FY 1992 Accomplishments:
 - (U) Obtained five year life test data on NiH₂ batteries in a LEO experiment.
 - (U) Developed an approach to insert advanced solar cells into arrays.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F Project Number: 2181
PE Title: Advanced Spacecraft Technology Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Advanced Space Electronics and Software Technology	9,489	12,067	11,803	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates technology to enable interchangeable, interoperable, and standardized data and signal processing subsystems for Air Force space and missile systems. This project will demonstrate the capability to manufacture and produce radiation hardened very high speed integrated circuit (VHSIC)-based components, wafer scale integration packages, and electronic subsystems. The Advanced Spaceborne Computer Module (ASCM) program integrates several joint Air Force/Strategic Defense Initiative efforts to develop the critical advanced on-board processing technology building blocks, independent of system architecture or configuration. Multiple source availability for the ASCM submodules will significantly reduce the development risk and cost of future on-board data processing subsystems. ASCM is designed to be 10 to 30 times faster and 100 times more radiation hard than late 1980's vintage space computer technology. The ASCM is divided into two phases. The first phase, the control processor module (CPM), will develop and qualify a radiation hardened 16 bit computer with three to five million instructions per second throughput. The second phase, the advanced technology insertion module (ATIM), will develop and qualify 32-bit radiation hardened computers with throughputs of 20-50 million instructions per second. Wherever possible, this project evaluates the feasibility of commercial technology insertion into Air Force space and missile systems. This project will also develop and verify reusable standard interface software for integrating spacecraft and ground systems by applying artificial intelligence concepts, increasing spacecraft autonomy from the ground station. This project also develops advanced models of spacecraft flight dynamics.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Assembled, tested, and space-qualified CPMs.
- (U) Designed the 32-bit microprocessor for the ATIM.
- (U) Qualified the first sub-micron radiation hardened electronics circuit fabrication line using the Quality Manufacturing Line (QML) methodology.
- (U) Developed high-speed integrated circuit packaging for memory and processor chip-sets into two inch by two inch packages.

2. (U) FY 1993 Planned Program:

- (U) Develop non-volatile memories for insertion into ATIM.
- (U) Develop and deliver radiation hardened 32-bit processors with performance benchmarks of 37 million instructions per second.
- (U) Begin on-array processor study to determine user speed and processing requirements.
- (U) Complete definition of spacecraft software architecture components.
- (U) Initiate development of reusable spacecraft software architecture and components.
- (U) Document spacecraft flight dynamics software routines.

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Program Element: #0603401F
PE Title: Advanced Spacecraft
Technology

Project Number: 2181
Budget Activity: #2 - Advanced Technology
Development

3. (U) FY 1994 Planned Program:

- (U) Integrate non-volatile memory technologies in advanced technology insertion module (ATIM) demonstrations.
- (U) Begin space-qualifying advanced radiation hardened high-speed one megabit static random access memory (SRAM).
- (U) Complete the integrated circuit and box level design for a 32-bit ATIM.
- (U) Fabricate required logic and memory integrated circuits, multi-chip packages, and subassemblies for the ATIM
- (U) Complete software development for the 32-bit ATIM.
- (U) Demonstrate three-dimensional packaging capability.
- (U) Complete space-qualification on non-volatile memory chips.
- (U) Develop reusable software architecture for ground control systems.
- (U) Ground demonstrate the integrated expert system for increased spacecraft and ground station autonomy.
- (U) Complete high fidelity model of spinning satellite.

4. (U) Program to Completion:

- (U) Complete delivery of ATIM sub-assembly.
- (U) Develop radiation hardening technology improvements for linear circuit devices.
- (U) Complete domain specific software architecture for ground control of satellites.
- (U) Complete reusable software architecture and supporting workbench for on-board satellite software development.
- (U) Complete real-time distributed operating system for spacecraft.
- (U) Produce astro, space, and missile dynamics handbook.

D. (U) WORK PERFORMED BY: Managed by the Phillips Laboratory's Space and Missiles Directorate, Kirtland AFB, NM. Contractors are: Honeywell, Clearwater, FL; IBM, Manassas, VA; and Mission Research Corp., Santa Barbara, CA. The analytical and numerical astrodynamics development is accomplished primarily in-house with some university support as required.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Due to withdrawal of SDIO share of funding, there is no longer a sensor array to processor array integration shown in the planned programs.
2. (U) SCHEDULE CHANGES: Schedule slippages are due primarily to withdrawal of SDIO funding.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) USSPACECOM MROC 04-88, Integrated Satellite Control System, January 1988.
- (U) AFSPACECOM SON 006-89, Space Support, Interoperability, and Readiness, March 1989.

G. (U) RELATED ACTIVITIES:

- (U) PE 0102431F, Advanced Warning System (AWS).
- (U) PE 0303603F, MILSTAR Satellite Communication System.
- (U) PE 0305160F, Defense Meteorological Satellite Program.
- (U) PE 0603215C, Limited Defense System.
- (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.

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Program Element: #0603401F
PE Title: Advanced Spacecraft
Technology

Project Number: 2181
Budget Activity: #2 - Advanced Technology
Development

(U) PE 0604609F, Reliability and Maintainability for Technology
Insertion Program (RAMTIP).

(U) This project has been coordinated through the Project Reliance
process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603402E
PE Title: Space Test Program (STP)

Project: 2617
Budget Activity: 6 - Defense-wide Mission Support

A. (U) RESOURCES: (\$ in Thousands)

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
2617 Space Test Program	43,706*	50,745	50,465	Cont	TBD

* Includes \$5M in FY 92 for Phillips Laboratory Geophysics Directorate's High Frequency Active Auroral Research Program (HAARP) which is unrelated to STP.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This STP project advances DOD space technology by providing spaceflight for DOD prioritized experiments: free flyer, shuttle hitch-hiker and shuttle mid-deck experiments. STP experiments are flown by priority, based on relevance to existing military requirements and the availability of cost effective means of space-flight on expendable launch vehicles or the shuttle. These flights are used for demonstration of new system technologies, concepts and designs, and for determining space environmental effects on military space systems. Historically, 45% of the free-flyer experiments can be satisfied by small satellite (100 to 500 pound class) missions, 35% require medium satellite (500 to 4,000 pounds) missions and 20% fly as piggyback missions. STP is also the pathfinder for exploiting the Shuttle as a manned DoD Space laboratory to exploit the infusion of new technology into space systems through the use of simpler, incrementally designed, man-aided experiments. Experience gained from this approach is key in fully defining military man's role in space. Currently, this project supports spacecraft development of 6 expendable launch vehicle (ELV) missions, on-orbit operations of 7 satellites, and integration of 8 piggyback experiments on non-STP developed spacecraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed P86-1, Combined Release and Radiation Effects Satellite (CRRES), and 87-1 Polar Bear.
- (U) Continued support for three P87-2 STACKSAT satellites and P-89-1A Radiation Experiment (REX).
- (U) Integrated, launched, and recovered Naval Research Laboratory Beryllium Induced Radiation Experiment (BINRAD) on Russian RESURS satellite.
- (U) Initiated and integrated the Radar Calibration (RADCAL) experiment (P92-1).
- (U) Continued integration/test for Space Test Experimental Platform (STEP) missions 1 and 0, and P90-6 Advanced Photovoltaic & Electronics Experiments (APEX), and completed initial design for STEP mission 2, P91-2 Signal Ident Expermt (SIDEEX).
- (U) Initiated STEP mission 3.
- (U) Completed System Design Review for P91-1 Medium Launch Vehicle (MLV - Class) Advanced Research & Global Observation Satellite (ARGOS).
- (U) Launched Shuttle Potential and Return Electron Experiment (SPREE).
- (U) Continued integration of Remote Atmospheric & Ionospheric Detection System (RAIDS) on TIROS J, Automated Charge Control at Geosynchronous Altitude (CHARGECON-GEO), Solar Wind Imaging Experiment (SWIM), Middle Atmosphere High Resolution Spectrograph (MAHRS) on CRISTA SPAS, and the Polar Orbiting Geomagnetic Survey (POGS) - II on Defense Meteorological Satellite Program (DMSP).
- (U) Completed integration test and placed P89-1B array of low energy X-ray imaging sensors (ALEXIS) in storage.
- (U) Successfully flew on Shuttle missions: RME-II & III, STL, AMOS, UPVI, VFT-2, and STAR.

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Program Element: 0603402F
PE Title: Space Test Program (STP)

Project: 2617
Budget Activity: 6 - Defense-wide Mission Support

2. (U) FY 1993 Planned Program:
- (U) Continue to support on-orbit missions.
 - (U) Launch and support P89-1B (ALEXIS), P90-6 (APEX), STEP mission 0, and RADCAL/Scout.
 - (U) Continue integration/test for STEP mission 1, CHARGE-CON GEO, and MAHRS.
 - (U) Continue design and development of STEP missions 2 and 3.
 - (U) Initiate P92-A FORTE.
 - (U) Conduct Preliminary & Critical Design Reviews for P91-1 ARGOS.
 - (U) Launch Energetic Heavy Ion Composition (EHIC)/Magnetospheric Atmospheric X-ray Imaging Experiment (MAXIE) on Thermal Infrared Observation Satellite (TIROS) - I/Atlas E; SWIM and RAIDS, and launch GLO Cryogenic Heat Pipe (GCP) hitchhiker experiment on STS-53.
 - (U) Launch and support Shuttle based experiments: Hercules, AMOS, SLS, CREAM, HRS GS-A, APE-B, CONCOP-1 and RME-III.
3. (U) FY 1994 Planned Program:
- (U) Continue to support on-orbit missions.
 - (U) Launch STEP missions 1 through 3, MAHRS, and POGS II.
 - (U) Initiate STEP mission 4.
 - (U) Build and test P91-1 ARGOS spacecraft and begin experiment integration.
4. (U) Program to Completion:
- (U) This is a continuing program.
- D. (U) Work Performed By: The responsible Air Force agency is Air Force Materiel Command, Space and Missile Systems Center, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. Government developing organizations include NASA/Goddard Space Flight Center, Greenbelt, MD. Contractors include TRW, Redondo Beach, CA; Defense Systems, Inc., McLean, VA; Rockwell International, Seal Beach CA; and Orbital Sciences Corporation, Chantilly, VA.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: BINRAD and RADCAL integration and launch support added to support Navy and AF test range requirements respectively.
 2. (U) SCHEDULE CHANGES: P89-1B ALEXIS/Pegasus F3 launch delayed based on need to correct Pegasus anomalies from prior launch. Mission 4 replanned to FY94 to support funding impacts on Mission 0. Mission 5 replanned to FY95. Initiate BIARAD Follow-on.
 3. (U) COST CHANGES: None.
- F. (U) PROGRAM DOCUMENTATION:
- (U) Tri-Service Regulation (AFR 80-2/AR 70-43/OPNAVINST 3913.1), STP Management, 30 November 1984.
- G. (U) RELATED ACTIVITIES:
- (U) PE 0305119F, (Medium Launch Vehicles).
 - (U) PE 0305171F, (Space Launch Support).
 - (U) There is no unnecessary duplication of effort within the AF or DoD.
- H. (U) OTHER APPROPRIATION FUNDS: Not applicable.

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Program Element: 0603402F
PE Title: Space Test Program (STP)

Project: 2617
Budget Activity: 6 - Defense-wide Mission Support

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Memorandum of Agreement exists between STP and ONR to secure secondary capacity on the French Centre National d'Etudes Spatiales (CNES) SPOT-3 spacecraft for ONR's Polar Ozone and Aerosol Measurement (POAM II) experiment.
- J. (U) MAJOR MILESTONES:
- | | |
|---|------------|
| 1. Shuttle launch of Tethered Sat System/SPREE | 4Q FY 1992 |
| 2. P91-1 ARGOS Preliminary Design Review | 1Q FY 1993 |
| 3. Launch GCP experiment on STS-53 | 1Q FY 1993 |
| 4. Launch P89-1B ALEXIS on Pegasus | 3Q FY 1993 |
| 5. TIROS launch of EHIC and MAXIE | 3Q FY 1993 |
| 6. Launch P92-1 RADCAL on Scout | 3Q FY 1993 |
| 7. P91-1 Critical Design Review | 3Q FY 1993 |
| 8. Launch P90-6 APEX on Pegasus | 4Q FY 1993 |
| 9. Launch STEP Mission 0 (P90-5 TAOS) on DARPA Taurus | 4Q FY 1993 |
| 10. Ariane launch of POAM-II on SPOT satellite | 4Q FY 1993 |
| 11. Launch P91-4 SWIM on NASA WIND satellite | 1Q FY 1994 |
| 12. Launch STEP Mission One (P90-1) on Pegasus XL | 1Q FY 1994 |
| 13. Launch of STEP Mission 2 P91-2 SIDEX on Pegasus | 1Q FY 1994 |
| 14. TIROS launch of RAIDS | 2Q FY 1994 |
| 15. Launch STEP Mission Three on Pegasus XL | 4Q FY 1994 |
| 16. Launch MAHRS on CRISTA-SPAS | 1Q FY 1995 |
| 17. Launch CHARGE-CON GEO on DSCS III | 3Q FY 1995 |
| 18. Launch P91-1 ARGOS on Delta II | 4Q FY 1995 |
| 19. Launch FORTE on Pegasus XL | 4Q FY 1995 |
| 20. Launch POGS-II on DMSP/Titan II | 1Q FY 1996 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603410F Budget Activity: #2 - Advanced Technology
 PE Title: Space Systems Environmental Interactions Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2821 Space Systems Design and Test Standards	753	566	173	Cont	TBD
2822 Space Environmental Impact Tests	2,899	2,769	2,246	Cont	TBD
2823 Space Hazards Mitigation	565	577	1,081	Cont	TBD
Total	4,217	3,912	3,500	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops, for space flight, advanced technology investigations that provide demonstrated, cost-effective solutions to mitigate hazardous space environmental interactions that degrade spacecraft operations. The information gained through these programs is directly transferred to operational users in the form of new and revised military standards (MIL-STDs), and computer-aided engineering (CAE) and assessment (CAA) tools. Advanced technology products include: (1) an autonomous active charge control system (CCS) to prevent charge buildup on high-altitude spacecraft; (2) a compact environmental anomaly sensor (CEASE) to provide warning to satellites of space-environmental conditions likely to cause anomalous operations; (3) new CAA tools for spacecraft mission assessment and space object identification based on optical measurements of effluent and other environmental interactions; and (4) improved specifications for advanced solar array technologies. The program's objective is to improve Air Force space systems survivability and reliability and expedite the transfer of new technology into planned military capabilities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2821, Space Systems Design and Test Standards: This project integrates the results of experiments conducted under Project 2822, Space Environmental Impact Tests, into useful analysis tools for Air Force space systems operators and designers. Results are used to improve engineering design guidelines and test standards, develop new radiation models and microelectronic test standards, and to enhance computer algorithm codes/models to aid in the analysis of environment-induced effects on spacecraft systems.

(U) FY 1992 Accomplishments:

- (U) Completed new draft MIL-STD and handbook for spacecraft surface charging.
- (U) Delivered new space environmental handbook for improving the characterization of the space environment for use in designing satellites.
- (U) Continued Combined Release and Radiation Effects Satellite (CRRES) data assessment for improved radiation models and cosmic ray model.

(U) FY 1993 Planned Program:

- (U) Deliver surface charging MIL-STD and handbook for providing effective design guidance for preventing surface charging damage in satellites.

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Program Element: #0603410F Budget Activity: #2 - Advanced Technology
PE Title: Space Systems Environmental Development
Interactions Technology

- (U) Complete revised microelectronics total-dose standard (Military Standard (MIL-STD) 883, Method 1019.2) to establish more realistic radiation test and qualification procedures for spacecraft microelectronics.
- (U) Incorporated interplanetary heavy ion and energetic-particle flux data from Combined Release and Radiation Effects Satellite (CRRES) into revised cosmic ray model.
- (U) FY 1994 Planned Program:
 - (U) Deliver electron auroral precipitation model to Air Weather Service Field Operating Agency/Space Forecast Center.
 - (U) Complete validation of cosmic ray model.
- (U) Work Performed By: This project is managed by Air Force Materiel Command's Phillips Laboratory, Geophysics Directorate, Hanscom AFB, MA. The main contractors performing the work are: S-Cubed, Inc., La Jolla, CA; University of Chicago, Chicago, IL.; Louisiana State University, Baton Rouge, LA; and Lockheed Palo Alto Research Laboratory, Palo Alto, CA.
- (U) Related Activities:
 - (U) 0602101F, Geophysics.
 - (U) NASA/Air Force Space Technology Interdependency Group coordinates efforts and reviews programs annually.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 2822, Space Environmental Impact Tests: In order to effectively counter adverse spacecraft-environment interactions, in-space demonstrations must be conducted to understand how new materials and technologies are affected by space. Much still remains unknown on the exact interaction mechanisms that cause thermal insulators and optical sensor deterioration, and deep-dielectric charging arcs that can cause spurious signals and upsets in microelectronics. Optical measurements from the ground and space provide characteristic signatures of spacecraft activities such as thruster firings as well as signatures of effluent which can be utilized for mission assessment. The project's technical programs will result in: (1) significant improvements in the technology base by developing space instrumentation that will measure hazards posed by the natural environment; (2) increased operational performance, longer lifetimes, and enhanced reliability of advanced space systems; and (3) an earlier capability to withstand the adverse effects of the space environment.
- (U) FY 1992 Accomplishments:
 - (U) Delivered the Photovoltaic Array Power plus Diagnostics (PASP Plus) flight experiment for integration into the Advanced Photovoltaic and Electronics Experiment (APEX) satellite for launch by the Pegasus launch vehicle.

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Program Element: #0603410F Budget Activity: #2 - Advanced Technology
PE Title: Space Systems Environmental Interactions Technology Development

- (U) Identified a generic signature of interactions between the atmosphere and spacecraft effluents.
 - (U) Completed calibrations on wake-side sensors for the Charge Hazards and Wake Studies (CHAWS) experiment; completed environmental tests; readied experiment for delivery.
 - (U) Launched the Shuttle Potential and Return Electron Experiment (SPREE) on STS-46.
 - (U) Baselined the instrument complement for the Space Waves Interactions with Plasmas Experiment (SWIPE).
 - (U) Completed the conceptual optical design and Charge Coupled Device (CCD) selection for the Solar Mass Injection Imager (SMEI).
- (U) FY 1993 Planned Program:
- (U) Launch Photovoltaic Array Power plus Diagnostics (PASP Plus) from the Western Test Range.
 - (U) Continue SPREE data analysis; publish instrument report.
 - (U) Conduct multi-spectral Air Force Maui Optical Station (AMOS) test program for satellite interactions; validate space contamination model.
 - (U) Conduct multi-spectral spacecraft interaction measurements using space-borne sensors.
 - (U) Complete integration of CHAWS aboard the University of Houston's Wake Shield Facility.
 - (U) Begin fabrication of SWIPE particle detectors.
- (U) FY 1994 Planned Program:
- (U) Publish preliminary report on PASP Plus flight results.
 - (U) Report final SPREE results; validate large-structure charging algorithm.
 - (U) Begin fabrication of particle detectors for SWIPE; deliver for spacecraft installation and tests.
 - (U) Launch CHAWS on STS-60; publish preliminary tech report.
- (U) Work Performed By: This project is managed by the Air Force Materiel Command's Phillips Laboratory, Geophysics Directorate Hanscom AFB, MA. The main contractors are: AMPTEK Inc., Bedford, MA; John Hopkins University Applied Physics Laboratory, Laurel, MD; and Spectral Sciences, Inc., Burlington, MA.
- (U) Related Activities:
- (U) 0602101F, Geophysics.
 - (U) 0603401F, Advanced Spacecraft Technology.
 - (U) 0603438F, Satellite Systems Survivability.
 - (U) 0603402F, Space Test Program.
 - (U) NASA/Air Force Space Technology Interdependency Group coordinates efforts and reviews programs annually.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: This program element has initiated a cooperative R&D agreement between the Phillips Laboratory (Geophysics Directorate) and the Canadian Space Agency (CSA) to provide diagnostic instrumentation as part of the Joint Air Force and NASA/CSA Waves in Space Plasmas (WISP) mission. WISP is scheduled for launch in September 1995.

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Program Element: #0603410F Budget Activity: #2 - Advanced Technology
PE Title: Space Systems Environmental Interactions Technology Development

3. (U) Project 2823, Space Hazards Mitigation: The Air Force needs the capability to prevent electrical charge buildup and the resulting disabling discharges on its operational satellites. For high-altitude and geosynchronous spacecraft, a Charge Control System (CCS) has been developed. The system is being integrated aboard a Defense Satellite Communications Satellite (DSCS) to validate the concept of autonomous active charge control and to baseline the prototype engineering design. For low/medium orbit satellites, a Compact Environmental Anomaly Sensor (CEASE) is being designed and developed to provide warnings on space conditions likely to produce anomalous behavior.
- (U) FY 1992 Accomplishments:
- (U) Completed design of microprocessor controller and CCS plasma-source power supply.
 - (U) Baseline CEASE instrument based on power, weight, and packaging constraints.
- (U) FY 1993 Planned Program:
- (U) Begin CCS integration on DSCS; program the final flight software for the charging algorithm.
 - (U) Initiate contract Phase II, Brassboard/Flight Unit Development of the demonstration hardware.
- (U) FY 1994 Planned Program:
- (U) Support CCS integration aboard DSCS; plan on-orbit operations.
 - (U) Continue CEASE flight unit development.
 - (U) Complete selection of the launch vehicle for CEASE.
- (U) Work Performed By: This project is managed by Air Force Materiel Command's Phillips Laboratory, Geophysics Directorate, Hanscom AFB, MA. The two primary contractors are: AMPTEK, Inc., Bedford, MA; and Assurance Technology Corp., Carlisle, MA.
- (U) Related Activities:
- (U) 0602101F, Geophysics.
 - (U) 0603402F, Space Test Program.
 - (U) NASA/Air Force Space Technology Interdependency Group coordinate efforts and reviews programs annually.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603438E

Budget Activity: #6 - Defense Wide Mission Support

PE Title: Satellite Systems Survivability

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2611 Survivability Planning Analysis	300	2,350	465	Cont	TBD
2612 Satellite Survivability	9,482	2,776	9,386	Cont	TBD
2613 Ground Station/Link Survivability	0	0	910	Cont	TBD
Total	9,782	5,126	10,732	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program performs survivability planning, modelling, analysis, concept evaluations and technology prototyping to meet current and projected military space system survivability requirements. Develops and demonstrates technologies and prototype hardware and software, as well as operational procedures, strategy, and tactics that will provide survivability capabilities for military space systems. The program is structured to provide a balanced development of survivability capabilities for the space, ground, and communications segments of space systems. Since space system life cycles are long and systems cannot be modified once on orbit, survivability must be incorporated early in the design process. Failure to protect our space systems could result in the denial of their critical support to the National Command Authorities and our military forces during crisis and conflict. The major prototyping efforts within this program are the Miniaturized Satellite Threat Reporting System (MSTRS) and Technology for Autonomous Operational Survivability (TAOS). MSTRS is a demonstration of an attack detection, characterization, and attack reporting system, composed of a suite of modular sensors which could be tailored for a specific satellite. TAOS is a free-flying space demonstration of several autonomy and survivability technologies. Technologies from this program are made available to all satellite program offices for system level implementation.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2611. Survivability and Planning Analysis:

Performs planning, analysis, modelling, and concept evaluation to meet current and projected space system survivability requirements. Develops software models and tools to evaluate and validate satellite survivability environmental responses and interactions to perform space asset survivability/vulnerability assessments.

(U) FY 1992 Accomplishments:

- (U) Continued analyses of evolving threat, technology needs, development priorities, and operational requirements. Completed investment analyses and used to draft an Air Force space system survivability roadmap.
- (U) Continued development of modelling and analysis tools for survivability trade studies.

(U) FY 1993 Planned Program:

- (U) Complete the survivability roadmap, ensuring it is consistent with satellite operator and satellite program office priorities.
- (U) Continue low level effort to develop and refine modelling and analysis tools; including multiple threat and effects, enhanced satellite fidelity, improved thermal and material interaction codes.

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Program Element: #0603438F
PE Title: Satellite Systems Survivability

Budget Activity: #6 - Defense Wide Mission Support

(U) FY 1994 Planned Program:

- (U) Update survivability roadmap and investment strategy.
- (U) Expand effort to develop and refine survivability simulation and modelling tools. Incorporate potentially unique, non-standard survivability techniques into the models.

(U) Work Performed By: Space and Missile Systems Center (SMC), Los Angeles, CA, has overall responsibility for program management. Aerospace Corp., Los Angeles, CA, provides technical assistance.

(U) Related Activities:

- (U) Program Element #0603218C, SDI Research and Support Activities
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2612, Technology Prototyping: Develops and prototypes satellite survivability technologies and operational concepts in support of current and projected space system survivability requirements. Satellite On-Board Attack Reporting System (SOARS)/Miniaturized Satellite Threat Reporting System (MSTRS) and Technology for Autonomous Operational Survivability (TAOS) are the major efforts. This technology is critical to ensure USCINCSpace is able to provide unambiguous assessment of attacks on U.S. Space Systems.

(U) FY 1992 Accomplishments:

- (U) SOARS program review indicated existing design was too large and heavy for most applications. AF terminated the existing SOARS development in March 1992 and redirected efforts toward a MSTRS requirements and concept study. MSTRS will push technologies to miniaturize the SOARS concept and incorporate advanced sensor and processor technologies.
- (U) Completed TAOS payload development and began spacecraft/payload integration and testing.

(U) FY 1993 Planned Program:

- (U) Complete MSTRS system requirements and concept study. Award MSTRS development contract 4Q FY93.
- (U) Launch TAOS on Space Test Experiment Platform (STEP) Mission 0 using DARPA's Taurus launch vehicle.
- (U) Conduct on-orbit operations of TAOS; begin TAOS payload mission analysis and reporting.

(U) FY 1994 Planned Program:

- (U) Continue MSTRS development (first full year of development contract); conduct Preliminary Design Review.
- (U) Complete TAOS on-orbit operations, analysis, and reporting.

(U) Work Performed By: MSTRS: Space and Missiles Systems Center, Los Angeles, CA. Aerospace Corp., Los Angeles, CA, manages MSTRS. The MSTRS concept study effort is with Phillips Laboratory, Albuquerque, NM; Sandia National Laboratory, Albuquerque, NM; and Los Alamos National Laboratory, Los Alamos, NM. The Aerospace Corporation, Los Angeles, CA, provides system engineering support for MSTRS. TAOS: Phillips Laboratory, Albuquerque, NM, manages the TAOS development effort. The TAOS payload contracts are with: Microcosm, Torrance, CA; GTE, Mountain View, CA; Honeywell, Phoenix, AZ; Rockwell, Anaheim, CA; TRW, Redondo Beach, CA; Intelligent Interactive Imagery Corp, Foster City, CA; and Sandia National Laboratory, Albuquerque, NM.

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Program Element: #0603438E
PE Title: Satellite Systems Survivability

Budget Activity: #6 - Defense Wide Mission Support

(U) Related Activity:

- (U) Program Element #0604711F, Systems Survivability
- (U) Program Element #0603218C, SDI Research and Support Activities
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 2613, Technology Advancement: Develops critical technologies to improve survivability of space, ground, and communications segments of space systems. Objective is to ready technology efforts for insertion into system applications.

(U) FY 1992 Accomplishments: Not applicable.

(U) FY 1993 Planned Program: Not applicable.

(U) FY 1994 Planned Program:

- (U) Initiate laser hardening demonstrations to include jamming resistance and advanced thermal coatings.
- (U) Initiate hardening demonstrations for optical communications links.
- (U) Initiate demonstrations of techniques for RF effects mitigation.

(U) Work Performed By: Space and Missiles Systems Center, Los Angeles, CA. Aerospace Corp., Los Angeles, CA, provides technical assistance.

(U) Related Activity:

- (U) PE #0603401F, Advanced Spacecraft Technology
- (U) PE #0603211F, Aerospace Structures and Materials
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F
PE Title: Conventional Weapons Technology

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
670A Ordnance Technology	17,619	12,082	12,954	Cont	TBD
670B Air-to-Surface Guidance Technology	9,076	8,400	7,040	Cont	TBD
670E Air-to-Air Guidance Technology	616	1,600	5,970	Cont	TBD
4168 Precision Strike	0	3,175	0	0	3,175
TOTAL	27,311	25,257	25,964	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates air-to-surface and air-to-air weapons technologies. Conventional weapons mid-course and terminal guidance, warheads, fuzes, explosives, advanced weapon aerial projectile concepts, and aeromechanics hardware and software are developed and demonstrated to determine effectiveness and potential operational value. This program demonstrates and reduces risk for technology transition into weapon systems upgrades and/or new weapon systems developments.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 670B, Air-to-Surface Guidance Technology: This project develops and demonstrates advanced guidance and control technologies and techniques. Objectives include: standoff delivery and threat avoidance through autonomous seeker operation; terminal guidance with increased accuracy, adverse-weather operation, and increased tactical flexibility; enhanced target classification and identification; improved countermeasures-resistant guidance capability; enhanced affordability; and enhanced tactical mission flexibility.

(U) FY 1992 Accomplishments:

- (U) Conducted captive flight tests on a laser radar terminal seeker.
- (U) Completed captive flight tests of synthetic aperture radar terminal seeker designs.
- (U) Demonstrated real-time targeting using synthetic aperture radar templates generated from Joint Surveillance Target Attack Radar System target imagery.

(U) FY 1993 Planned Program:

- (U) Continue laser radar terminal seeker efforts.
- (U) Evaluate laser radar software algorithms' utility in steep angles-of-attack for direct attack munitions.
- (U) Implement system improvements such as real-time targeting and sensor fusion for laser radar terminal seekers.
- (U) Conduct laser radar terminal seeker flight tests to demonstrate scanning and real-time processing for target acquisition and terminal guidance.

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Program Element: #0603601F
PE Title: Conventional Weapons Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) Complete real-time targeting demonstrations for synthetic aperture radar terminal guidance seekers.
- (U) Continue synthetic aperture radar cost and risk reduction efforts through analysis and captive flight demonstration of revised hardware and software.
- (U) FY 1994 Planned Program:
 - (U) Complete data analysis for laser radar captive flight tests and begin planning for free-flight (drop) test.
 - (U) Begin test preparation for synthetic aperture radar free-flight (drop) test.
 - (U) Initiate low cost Inertial Navigation System/Global Positioning System terminal guidance demonstration.
- (U) Work Performed By : Wright Laboratory's Armament Directorate, Eglin AFB, FL, is responsible for program management and technical activity. Test facilities at the Air Force Development Test Center, Eglin AFB, FL, support this program. Contractors are: Hughes Missile Systems Company, San Diego, CA; Raytheon Corp., Bedford, MA; and Loral, Phoenix AZ.
- (U) Related Activities
 - (U) PE 0602602F, Conventional Munitions.
 - (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
 - (U) PE 0603792N, Advanced Technology Demonstrations.
 - (U) PE 0604407D, Joint Standoff Weapon.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 670E, Air-to-Air Guidance Technology: This project develops and demonstrates advanced air-to-air guidance technologies. The emphasis is on missile guidance technologies for use against future threats with evading/maneuvering characteristics. Objectives include acquisition of reduced signature targets, improved countermeasure performance, autonomous seeker operation, and precision guidance. These technical goals will allow for reduced miss distances, adverse-weather operation, increased tactical mission options, improved survivability, more reliable system operation, and enhanced affordability. Efforts are focused on a multi-spectral seeker which combines dual radio frequency (RF) guidance technologies.
 - (U) FY 1992 Accomplishments:
 - (U) Established in-house simulation and analysis capability to support evaluation of multi-spectral seeker performance.
 - (U) Completed multi-mode seeker simulation model.
 - (U) Completed simulation of reduced RF signature effects on seekers.
 - (U) Completed simulation and evaluation of multi-spectral RF seeker performance.
 - (U) FY 1993 Planned Program:
 - (U) Initiate conceptual design of a multi-spectral terminal seeker.
 - (U) Enhance signal processor packing design development for missile guidance and mode control.

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Program Element: #0603601F
PE Title: Conventional Weapons Technology

Budget Activity: #2 - Advanced Technology Development

- (U) Conduct radome material investigations for wide band RF and infrared transmission.
- (U) FY 1994 Planned Program:
 - (U) Begin fabrication of a multi-spectral terminal seeker.
 - (U) Conduct multi-spectral terminal seeker simulation.
 - (U) Complete radio frequency tracking technology for air-to-air terminal seeker electronic countermeasures, signature, and radar handover demonstrations.
 - (U) Conduct missile seeker simulations/evaluations.
- (U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB, FL, is the responsible technical activity. The test facilities at the Air Force Development Test Center, Eglin AFB, FL, support this program. A contractor has not been selected.
- (U) Related Activities:
 - (U) PE 0602602F, Conventional Munitions.
 - (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
 - (U) PE 0603792N, Advanced Technology Demonstrations.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 4168, Precision Strike: This new effort began in FY 1993. This project demonstrates the accuracy of an Inertial Navigation System/Global Positioning System (INS/GPS)-equipped weapon. The project will be completed in FY 1993.
 - (U) FY 1992 Accomplishments: Not Applicable.
 - (U) FY 1993 Planned Program:
 - (U) Integrate an INS/GPS into an existing weapon.
 - (U) Complete the demonstration of an INS/GPS-equipped weapon.
 - (U) FY 1994 Planned Program: Project terminated.
- (U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB, FL, manages the program and technical activity. Test facilities at the Air Force Development Test Center, Eglin AFB, FL; Arnold Engineering Development Center, Arnold AFB, TN; 46th Test Group, Holloman AFB, NM; and the Naval Air Weapons Station, China Lake, CA, support this program. Contractors have not been selected.
- (U) Related Activities:
 - (U) PE 0602102F, Materials.
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0602202F, Human Systems Technology.
 - (U) PE 0602203A, Missile Technology.
 - (U) PE 0602204F, Aerospace Avionics.
 - (U) PE 0602602F, Conventional Munitions.
 - (U) PE 0602702F, Command, Control, and Communications.

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Program Element: #0603601F

Budget Activity: #2 - Advanced Technology Development

PE Title: Conventional Weapons Technology

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
 - (U) PE 0603238F, Air Defense/Precision Strike Technology Demonstration.
 - (U) PE 0603245F, Advanced Fighter Technology Integration.
 - (U) PE 0604618F, Joint Direct Attack Munition.
 - (U) The specific projects have been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to ensure non-duplication and compatibility with the integrated demonstrations.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F
PE Title: Conventional Weapons
Technology

Project Number: 670A
Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Ordnance Technology	17,619	12,082	12,954	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project develops and demonstrates the feasibility, effectiveness, and operational utility of conventional (non-nuclear) ordnance technologies for current and future air-delivered weapons. Develops and demonstrates the following technologies: fuzes; insensitive and less sensitive explosives; warheads; bombs, submunitions, and their dispensing mechanisms; air-to-surface composite weapon airframes; advanced aerial projectiles; and adaptable submunitions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed component proof-of-concept testing, design, and fabrication of form-factored components for an air-to-air missile warhead package.
- (U) Conducted safety tests for inventory bombs filled with new insensitive high explosive formulations.
- (U) Conducted successful testing of an adaptable submunition multi-mode warhead (e.g., a submunition that autonomously changes its explosive mode (single versus multi-fragment) based upon target type).
- (U) Completed integration testing of a hard target ordnance package for defeat of buried targets and conducted sled tests.

2. (U) FY 1993 Planned Program:

- (U) Complete component testing for an air-to-air missile warhead package.
- (U) Initiate development of an insensitive munition fuze for all-up general purpose bombs.
- (U) Initiate design of a multi-mode warhead for an anti-materiel submunition compatible with current target classifying sensors and maneuverable submunition airframe technologies.
- (U) Fabricate dual-mode launcher hardware capable of launching inventory air-to-air missiles from aircraft internal weapons bays.
- (U) Complete technology demonstration of a programmable fuze.
- (U) Complete design of cased telescoped 20 millimeter combat ammunition for a 5000 feet per second round for advanced air-to-air and air-to-surface guns.

3. (U) FY 1994 Planned Program:

- (U) Complete ground testing for the air-to-air missile warhead package.
- (U) Complete brassboard design for an anti-materiel submunition multi-mode warhead.
- (U) Complete preliminary design of Boosted Penetrator.
- (U) Conduct technology demonstration of a dual-mode launcher capable of launching inventory air-to-air missiles from aircraft internal weapons bays.

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Program Element: #0603601F
PE Title: Conventional Weapons
Technology

Project Number: 670A
Budget Activity: #2 - Advanced Technology
Development

- (U) Initiate design for a velocity-augmented munition.
- (U) Initiate development of low-drag/low-observable weapon airframes for 2000 pound class dispenser and unitary weapons.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Wright Laboratory's Armament Directorate, Eglin AFB, FL, is responsible for program management and technical activity. Test facilities at the Air Force Development Test Center, Eglin AFB, FL; Arnold Engineering Development Center, Arnold AFB, TN; 46th Test Group, Holloman AFB, NM; and the Naval Air Weapons Station, China Lake, CA, support this program. Major contractors are: McDonnell Douglas, St. Louis, MO; Lockheed Missile and Space, Sunnyvale, CA; Motorola Inc., Scottsdale, AZ; and General Electric Co., Burlington VT.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) Tactical Air Forces (TAF) Statement of Need (SON) 335-88, Advanced Capability Anti-Radiation, 6 June 1990.
- (U) TAF SON 317-87, Advanced Attack Weapon, 16 May 1989.
- (U) Strategic Air Command (SAC) SON 001-85, Strategic Relocatable Target Capability, 10 June 1986.
- (U) SAC SON 18-82, Strategic Conventional Standoff Capability, 19 June 1984.
- (U) Air Force Logistics Command SON 02-83, Munitions Hazard Reduction, 20 May 1985.
- (U) TAF SON 306-85, Multi-Purpose All-Up Round Development, 24 March 1987.
- (U) TAF SON 309-88, Reducing the Risk of Munitions Operations, 22 May 1989.
- (U) TAF SON 303-85, Hardened Target Munitions, 20 May 1985.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0602205F, Aerospace Vehicle Technology.
- (U) PE 0604602F, Armament/Ordnance Development.
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
- (U) PE 0603792N, Advanced Technology Demonstrations.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|---|----------------|
| 1. (U) Fabricate dual-mode launcher | January 1993 |
| 2. (U) Complete ordnance package design for programmable fuze | September 1993 |
| 3. (U) Conduct sled test of programmable fuze | September 1993 |

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Program Element: #0603601F
PE Title: Conventional Weapons
Technology

Project Number: 670A
Budget Activity: #2 - Advanced Technology
Development

- | | | | |
|----|-----|---|----------------|
| 4. | (U) | Complete air-to-air missile warhead package
ground test evaluation | March 1994 |
| 5. | (U) | Initiate low-drag/low-observable weapon air frame
for 2000 pound class weapons | September 1994 |
| 6. | (U) | Complete preliminary design of Boosted Penetrator | September 1994 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3150 Advanced Optics Technology	9,831	27,430*	6,500	Cont	TBD
3151 High Power Semiconductor Laser Technology	12,386	12,353	10,500	Cont	TBD
3152 High Power Microwave (HPM) Technology	10,932	9,860	10,700	Cont	TBD
3277 Systems Survivability Technology	479	260	400	Cont	TBD
3647 High Energy Laser Technology	28,702	31,348**	27,315	Cont	TBD
Total	62,330	81,251	55,415	Cont	TBD

* Includes Congressional adds of \$11.6M for LADAR (Laser Detection and Ranging) and \$10M for excimer laser.

** Includes \$10M excimer laser Congressional add.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element is the advanced technology development program for directed energy (DE) concepts and advanced optical imaging systems. Speed-of-light weapons and long-range, high resolution optical imaging through the turbulent atmosphere offer significant payoffs. This program element has been responsible for major technology breakthroughs in removing atmospheric distortions from laser beams and other optical transmissions, in producing high resolution optical imagery of distant objects, in fabricating small relatively high-power laser diode phased arrays, and in furthering the understanding of HPM radiation effects. Major emphasis areas include: HPM sources and ground-based and airborne laser weapons technologies; high resolution, long-range optical imaging (e.g., space object identification); moderate power laser diode arrays; and DE and/or nuclear weapons effects on S. systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3150, Advanced Optics Technology: This project develops advanced optical technologies for imaging distant or dim objects. This work supports high energy laser technologies (ground-based and airborne) since an imaging subsystem is required for target verification, accurate and sustainable laser beam placement on target, and damage assessment. Advanced technologies including nonlinear optics, adaptive optics, and specialized signal processing are being developed. The goal is high quality optical image reconstruction, concentrating on removing turbulent atmosphere-induced distortions. Many of these developed technologies (both techniques and hardware) also have significant application to astronomical research.

(U) FY 1992 Accomplishments:

- (U) Delivered nonlinear optics (NLO) imaging brassboard for first real-time demonstration of airborne image distortion removal.
- (U) Conducted experiments and simulations to evaluate design concepts for the Active Imaging Testbed (AIT) and follow-on deep space imaging systems.
- (U) Demonstrated high resolution imaging techniques for space object identification during limited daylight hours.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) Demonstrated pre-compensated passive imaging for advanced tracking and laser beam aimpoint maintenance on satellites.
 - (U) Transferred passive imaging technology for application at the Air Force Maui Optical Site (AMOS).
 - (U) Performed field test to acquire satellites and sky background data in preparation for transitioning daylight satellite imaging.
 - (U) Conducted experiments to evaluate coherence, output energy, and scalability of excimer lasers for use as long-range, high resolution active imaging illuminators.
- (U) FY 1993 Planned Program:
- (U) Evaluate advanced high resolution passive space object imaging techniques on 3.5 meter telescope.
 - (U) Demonstrate new generation optical sensor for imaging experiments.
 - (U) Demonstrate full daytime satellite imaging techniques.
 - (U) Transition initial operational capability for daytime imaging of satellites to AMOS.
 - (U) Begin nonlinear optics (NLO) imaging brassboard evaluation to demonstrate atmospheric compensation on an airborne imaging system.
 - (U) Begin joint development, with the Navy, on an interferometric imaging approach.
 - (U) Complete illuminator laser risk reduction experiments and select a candidate laser device for the Active Imaging Testbed (AIT).
 - (U) Complete AIT sensor design and begin fabrication.
 - (U) Develop carbon dioxide laser oscillator and direct detection receiver for Laser Detection and Ranging (LADAR) imaging.
 - (U) Begin developing coherent LADAR range-doppler imaging receiver.
- (U) FY 1994 Planned Program:
- (U) Upgrade the 3.5 meter telescope equipment to improve imaging performance.
 - (U) Demonstrate 24-hour moderate resolution capability at AMOS.
 - (U) Develop advanced data acquisition hardware/software to improve data processing of multiple satellite images.
 - (U) Perform laboratory demonstration for sensing and correcting system aberrations of large telescopes.
- (U) Work Performed By: The Phillips Laboratory's Lasers and Imaging Directorate, Kirtland AFB, NM, conducts major in-house research efforts and manages the project. The top five contractors are: ATA Corporation, Albuquerque, NM; Rockwell Power Services Company, Albuquerque, NM; RDA-Logicon, Marina del Rey, CA; S Systems Corporation, Inglewood, CA; and the University of Arizona Optical Sciences Center, Tucson, AZ.
- (U) Related Activities:
- (U) PE 0602601F, Advanced Weapons.
 - (U) PE 0603217C, Follow-on Systems.
 - (U) PE 0602102F, Materials.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Budget Activity: #2 - Advanced Technology
Development

2. (U) Project 3277, Systems Survivability Technology: This project develops technologies to evaluate and enhance Air Force system electromagnetic pulse survivability.
- (U) FY 1992 Accomplishments:
- (U) Developed and tested improved nuclear simulation field test measurement, recording, and reduction systems.
- (U) FY 1993 Planned Program:
- (U) Demonstrate distributed switch for more realistic rapid pulse risetime simulation.
- (U) FY 1994 Planned Program:
- (U) Begin developing a distributed array electromagnetic pulse simulator.
- (U) Work Performed By: The Phillips Laboratory's Advanced Weapons and Survivability Directorate, Kirtland AFB, NM, manages this program. No contracts have been awarded at this time.
- (U) Related Activities:
- (U) PE 0602601F, Advanced Weapons.
 - (U) PE 0602204F, Aerospace Avionics.
 - (U) PE 0604711F, Systems Survivability (Nuclear Effects).
 - (U) PE 0602715H, Defense Nuclear Agency.
 - (U) PE 0603749F, Command, Control, Communication Countermeasures Advanced Systems.
 - (U) PE 0604747F, Electromagnetic Radiation Test Facilities.
 - (U) PE 0604312F, Intercontinental Ballistic Missile Modernization.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons Technology

Project Number: 3151
Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Title</u> <u>Popular Name</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
High Power Semiconductor Laser Technology	12,386	12,353	10,500	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project continues to yield revolutionary breakthroughs in compact, robust, low-cost laser system technology, which is being transitioned/developed for a wide range of military applications requiring low to moderate power optical sources. It builds upon and enhances commercial advancements. Commercially available semiconductor lasers (1/10 watt) are widely used due to their low-cost, small size and weight, high reliability, and high efficiency in converting electricity to laser energy. The project preserves these attractive features while scaling to the higher powers (one to ten watts and above) and/or military application specific wavelengths. The project is divided into three integrated technology areas. First, it investigates methods to increase output power from individual semiconductor laser diodes. Second, it develops individual laser and semiconductor laser array integration methods, producing a single, high quality laser beam at significantly higher power levels. Third, it develops wavelength-specific laser diodes for military applications. This technology has many commercial applications, especially for eye-safe lasers.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Demonstrated mass producibility of high quality, coherent, end-to-end coupled and side-to-side coupled laser diode arrays.
- (U) Developed greater than ten times (10x) yield improvement in advanced integrated laser array chips fabrication.
- (U) Coupled four subscale diode arrays forming a two-dimensional diode module.
- (U) Demonstrated 45 watts from a continuous wave, two-dimensional laser source for external optical cavity systems.
- (U) Demonstrated a two watt laser diode for use as a high power building block for diode arrays.
- (U) Built world's first mid-infrared semiconductor laser producing one watt continuous output at room temperature.
- (U) Demonstrated a laser device for battlefield medical treatment applications.

2. (U) FY 1993 Planned Program:

- (U) Demonstrate 20-50 watt, high quality beam from combined modules where each module is a phased array of laser diodes.
- (U) Incorporate coherent array coupling and cooling techniques into mid-infrared laser arrays.
- (U) Demonstrate four micron wavelength infrared laser source for applications such as remote sensing and heat seeker countermeasures.
- (U) Transition array technology for short-range application field evaluation.

3. (U) FY 1994 Planned Program:

- (U) Demonstrate ten watt eye-safe laser beam at room temperature.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Project Number: 3151
Budget Activity: #2 - Advanced Technology
Development

- (U) Demonstrate five to ten watt, high quality beam from a single semiconductor laser diode.
- (U) Transition 10-50 watt devices for applications such as wind sensors, laser communications, remote sensing, access denial, and long-range illumination.
- (U) Incorporate high power (one watt class) single emitter "building blocks" into laser array architectures.

4. (U) Program to Completion:

- (U) This is a continuing program.
- (U) Continue developing one to ten watt single emitter "building blocks" for coherent array architectures, particularly in the mid-infrared spectrum.
- (U) Demonstrate 20 watt semiconductor lasers at a variety of wavelengths, especially infrared.
- (U) Continue to transition laser diode array technology to higher power and wavelength-specific applications.

D. (U) WORK PERFORMED BY: The Phillips Laboratory's Lasers and Imaging Directorate, Kirtland AFB, NM, performs major in-house research and manages this program. The five top contractors are: McDonnell Douglas, St. Louis, MO; SRI, David Sarnoff Research Center, Princeton, NJ; TRW, Redondo Beach, CA; Spectra Diode Laboratories Incorporated, San Jose, CA; and Hughes-Danbury Optical Systems, Danbury, CT.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) MAC SON 003-87, Air Force Special Operations Forces (AFSOF) Aircraft Intraformation Positioning System (IFPS), 20 September 1989.
- (U) SAC SON 025-87, Denial Systems for Nuclear Weapons Security, 13 February 1989.
- (U) TAF SON 312-88, Follow-On Close Air Support (CAS) Aircraft, 20 September 1989.
- (U) TAF SON 327-88, Dispersed Weapons Systems Security, 6 November 1989.
- (U) TAF SON 323-88, Advanced Infrared Countermeasures for TAF Aircraft, 6 November 1989.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602601F, Advanced Weapons.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603250F, Lincoln Laboratory.
- (U) PE 0602234N, Systems Support Technology.
- (U) Representatives from Army, Navy, Strategic Defense Initiative Office, National Laboratories, and Air Force using commands are members of the government review team for this technology.
- (U) Joint field demonstrations of this technology are ongoing with: the Air Force Pararescue School; the Air Force Special Operations Command; the U.S. Coast Guard; and the U.S. Customs Service.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Project Number: 3151
Budget Activity: #2 - Advanced Technology
Development

- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.
J. (U) MILESTONE SCHEDULE: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons Technology

Project Number: 3152
Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Title</u> <u>Popular Name</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
High Power Microwave (HPM) Technology	10,932	9,860	10,700	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops high power microwave (HPM) generation technologies. It also develops a susceptibility/vulnerability/lethality data base to identify potential vulnerabilities of U.S. systems to HPM threat parameters and to provide a basis for future weaponization decisions. Representative U.S. and foreign assets will be tested to understand real system susceptibilities. Both wideband (wide frequency range) and narrow band (very small frequency range) technologies are being developed.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed transformer driven compact split cavity oscillator development.
- (U) Achieved significant laser activated solid state switch lifetime improvement.
- (U) Measured microwave coupling in a non-flyable F-16 testbed developed from several crashed aircraft.
- (U) Completed Low Altitude Navigation Targeting Infrared for Night (LANTIRN) system HPM susceptibility measurements.
- (U) Began contractual actions for a 15 megawatt magnetohydrodynamic generator for use as a prime power source.
- (U) Verified ultra-wideband test methodology on a tactical missile.

2. (U) FY 1993 Planned Program:

- (U) Complete high power solid state microwave source module and begin array development.
- (U) Complete gigawatt (GW) class solid state HPM array design.
- (U) Begin F-16 testbed high power susceptibility testing, particularly the fly-by-wire technology.
- (U) Complete compact, multi-pulsed, tunable HPM source development.
- (U) Provide LANTIRN HPM hardening recommendations.
- (U) Complete silicon switched ultra-wideband source system.

3. (U) FY 1994 Planned Program:

- (U) Complete F-16 testbed HPM assessment.
- (U) Complete high power solid state array HPM device to explore weaponization.
- (U) Complete target characterization for an aircraft self-protection advanced technology demonstration.
- (U) Begin multi-GW wideband antenna development for advanced technology demonstration.
- (U) Upgrade aircraft HPM vulnerability models.
- (U) Begin aircraft self-protection technology development.

4. (U) Program to Completion:

- (U) This is a continuing program.
- (U) Continue HPM effects assessments on Air Force and foreign systems.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Project Number: 3152
Budget Activity: #2 - Advanced Technology
Development

- (U) Develop ultra-wideband sources and antennas.
- (U) Develop specific narrowband sources and antennas.
- (U) Develop tunable high power microwave (HPM) source for effects testing and weaponization evaluation.
- (U) Continue developing technology for applications such as access denial, aircraft self-protection, etc.

D. (U) WORK PERFORMED BY: The Phillips Laboratory's Advanced Weapons and Survivability Directorate, Kirtland AFB, NM, performs major in-house research and manages this program. The top five contractors are: Maxwell Laboratories, San Diego, CA; Kaman Sciences Corp., Dikewood Division, Albuquerque, NM; Mission Research Corporation, Santa Barbara, CA; Fiore Industries, Albuquerque, NM; and Power Spectra Inc., Sunnyvale, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 323-88, Advanced Infrared Countermeasures for Tactical Air Forces Aircraft, 6 September 1989.
- (U) TAF SON 341-88, Radio Frequency Countermeasures, 30 October 1989.
- (U) SAC SON 010-89, Draft, Bomber Lethal Penetration Aids, 14 July 1989.
- (U) MAC SON 007-81, Defensive Systems for Airlifter Aircraft, 24 May 1982.
- (U) SAC SON 025-87, Denial Systems for Nuclear Weapons Security, 15 February 1989.
- (U) SAC MNS 025-87, Denial Systems for Nuclear Weapon Security, January 1992.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602601F, Advanced Weapons.
- (U) PE 0602120A, Electronic Survivability and Fuzing Technology.
- (U) PE 0602111N, Anti-Air Warfare, Anti-Surface Warfare Technology.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603737D, Balanced Technology Initiative.
- (U) PE 0602601F, Advanced Weapons.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Project Number: 3647
Budget Activity: #2 - Advanced Technology
Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Title</u> <u>Popular Name</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
High Energy Laser Technology	28,702	31,348	27,315	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates technology and conducts detailed assessments needed for high energy laser weapons. The technology developed by this project is directly applicable to most high power applications. The project demonstrates the critical technologies for: (1) scalable laser devices; (2) optical components; and (3) laser beam control to efficiently compensate and propagate the laser radiation through the atmosphere to a target. It also develops and uses detailed computational models to establish laser weapon effectiveness and satellite and missile vulnerability. Correcting the laser beam for atmospheric disturbances is the key technology in most high energy laser applications. The beam control technology developed in this project had, and will continue to have, a significant benefit to the astronomy community.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed laboratory testing of advanced chemical oxygen iodine laser (COIL) technologies (50% power increase and significant size reduction) and identified promising applications.
- (U) Demonstrated performance of advanced atmospheric compensation technology (three times improvement) through field experiments on 1.5 meter telescope.
- (U) Completed fabrication of the 3.5 meter telescope and began development of first generation beam train and adaptive optics.
- (U) Demonstrated ability to illuminate satellite targets for active imaging experiments and began development of a moderate power illuminator laser to support active tracking experiments.
- (U) Performed satellite vulnerability assessments for additional targets and established better lethality criteria for lasers.
- (U) Evaluated laser weapon implications of maintaining the laser beam on various aimpoints on satellite targets.
- (U) Conducted experiments to improve efficiency of excimer lasers.
- (U) Conducted analysis and experiments of unique effects using an excimer laser type device.

2. (U) FY 1993 Planned Program:

- (U) Activate 3.5 meter telescope and begin field checkout of first generation adaptive optics.
- (U) Begin developing moderate power illuminator laser for future active tracking experiments.
- (U) Begin developing scaled laser device component hardware to establish suitability and performance for high power COIL devices for ground and airborne applications.
- (U) Conduct first closed loop atmospheric compensation experiments using the 3.5 meter telescope.
- (U) Begin refining satellite vulnerability assessments.
- (U) Exploit basic excimer laser source and coupling technology for high payoff applications.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Project Number: 3647
Budget Activity: #2 - Advanced Technology
Development

- (U) Complete experiment design and begin component hardware development for a series of optical atmospheric measurements conducted from an airborne platform.

3. (U) FY 1994 Planned Program:

- (U) Begin development of second generation adaptive optics for the 3.5 meter telescope.
- (U) Complete fabrication of the moderate power illuminator laser and its field integration with the one meter beam director to support active imaging experiments.
- (U) Begin developing scaled optical components technology, reducing risk for full-scale high energy laser systems.
- (U) Conduct boost-phase theater missile lethality analysis, refining understanding of damage/failure modes to high energy lasers engagements.
- (U) Evaluate and demonstrate concepts for improved oxygen generator efficiency, fuel recycling, reducing re-fire time between shots, and reducing weight, using the scaled chemical oxygen iodine laser (COIL) device.
- (U) Conduct atmospheric compensation and beam control experiments with the 3.5 meter telescope and first generation adaptive optics and beam control hardware.
- (U) Conduct experiments on passive compensated tracking of satellites.
- (U) Assess satellite vulnerability to COIL laser beams.
- (U) Complete airborne optical atmospheric measurements.
- (U) Complete experiment design and begin hardware development for horizontal propagation path atmospheric compensation experiments conducted from an airborne platform.
- (U) Establish technology requirements for adaptive optics and beam control in horizontal atmospheric propagation scenarios for airborne laser applications.

4. (U) Program to Completion:

- (U) This is a continuing program.
- (U) Further develop specific component technologies for airborne and ground applications.
- (U) Conduct integrated ground-based beam control experiments to demonstrate, at full-scale, all technology components.
- (U) Finalize satellite vulnerability assessments, technology definition, performance/effectiveness analysis, and risk assessments for a ground-based anti-satellite weapon.
- (U) Demonstrate sufficient placement of a low power laser beam, including atmospheric compensation, from an airborne platform against realistic targets.

D. (U) WORK PERFORMED BY: The Phillips Laboratory's Lasers and Imaging Directorate, Kirtland AFB, NM, performs major in-house research and manages this program. The five top contractors are: Textron Defense Systems (Everett Research Laboratory), Everett, MA; Rockwell Power Service Company, Albuquerque, NM; RDA-Logicon, Marina del Rey, CA; Rockwell International Rocketdyne Division, Canoga Park, CA; and The Optical Sciences Company, Placentia, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: \$10M was appropriated in this project for a classified excimer laser technology effort.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

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Program Element: #0603605F
PE Title: Advanced Weapons
Technology

Project Number: 3647
Budget Activity: #2 - Advanced Technology
Development

F. (U) PROGRAM DOCUMENTATION:

- (U) AFSPACECOM MNS for Space Control Anti-Satellite (ASAT) Capability, 19 May 1988, (S).
- (U) Acquisition Decision Memorandum (ADM), Anti-satellite Systems, 6 March 1989, (S).
- (U) USSPACECOM Anti-satellite (ASAT) Concept of Operations (CONOPS), 12 October 1989, (S).
- (U) Requirements for an ASAT Program, MJCS 201-86, Joint Chiefs of Staff, 22 September 1988, (S).
- (U) USSPACECOM Multicommand Required Operational Capability (MROC) 03-87 for a Space Control ASAT Capability, Joint Chiefs of Staff, SM-77-88, 5 February 1988, (S).

G. (U) RELATED ACTIVITIES:

- (U) PE 0602601F, Advanced Weapons.
- (U) PE 0603319F, Airborne Theater Defense Technologies.
- (U) PE 0350910F, SPACETRACK.
- (U) PE 0603217C, Follow-on Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603617E
 PE Title: Command, Control, & Communications
(C3) Applications

Budget Activity: #5 - Communications
and Intelligence

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2314 Tactical Air Surveillance	100	96	576	Cont	TBD
2317 Tactical Air Information Production & Distribution	100	850	4,505	Cont	TBD
2321 Tactical Battle Information Management	2,859	2,725	4,122	Cont	TBD
3804 Tactical Air Forces Systems Integration	100	190	192	Cont	TBD
Total	3,159	3,861	9,395	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT:

Rapidly transitions developments in the Science and Technology base to existing C3 programs or directly to warfighting commands. Projects are directly responsive to operational requirements for improved battle management, communications, theater missile defense, and surveillance capability. Takes advantage of advanced technology developments throughout the services and industry as well as off-the-shelf technology. Products are primarily advanced development models, rapid prototype efforts, and software developed through evolutionary acquisition methods. Program also defines system architectures and develops communications technology for modernizing and improving the Air Force portion of the Tri-Service communications networks which the Defense Information Systems Agency (DISA) oversees.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2314, Tactical Air Surveillance:

Develops advanced technology and demonstrates equipment improvements to the Tactical Air Control System (TACS) ground surveillance radars. Investigates non-radar and/or adjunct radar sensors to address the Tactical Air Forces (TAF) surveillance, detection and tracking requirements not satisfied by an active radar.

(U) FY 1992 Accomplishments:

- (U) Continued solid state transmitter panel development and testing planning.
- (U) Published final technical report on Multiple Sidelobe Canceler and Mainlobe Noise Canceler (MSLC/MNC) Study and Design for Radar Set AN/TPS-75.

(U) FY 1993 Planned Program:

- (U) Complete solid state transmitter panel development and testing and initiate system improvement configuration development for integration into the AN/TPS-75 radar.

(U) FY 1994 Planned Program:

- (U) Initiate parallel development efforts in waveform generation and signal processing improvements to improve detection and track performance against conventional and low radar cross section targets in severe ground clutter environments.

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Program Element: #0603617F
PE Title: Command, Control, & Communications
(C3) Applications

Budget Activity: #5 - Communications
and Intelligence

- (U) Initiate MSLC/MNC development, based on previous study, to improve performance in noise jamming environments.

(U) Work Performed By: All tasks in this program are managed through Rome Laboratories, Griffiss AFB, NY and Electronic Systems Division, Hanscom AFB, MA. Contractors include Westinghouse Electric Corp., Baltimore MD; PAR G through Rome Laboratories, Griffiss AFB, NY and Electronic Systems Division, Government Systems/Sensis Corp., New Hartford NY/Syracuse NY; Paramax, Minneapolis MN; CTA, Inc., Falcon Communications, Colorado Springs CO; CALSPAN-UB Research Center, Buffalo NY; Rome Research Corp., Rome NY; Ford Aerospace and Communication Corp., Colorado Springs CO; Sterling Software Company, Bellevue NE; Ford Aerospace Corp., San Jose CA; Stanford Telecommunications Inc, Reston VA; Lincoln Labs, Lexington MA; Harris Corp., Melbourne FL; Signatron Inc., Lexington MA; Motorola, Scottsdale AZ; Raytheon, Sudbury MA; National Communications Systems, Washington DC; MITRE Corp., Bedford MA; and Computer Engineering Associates, Avon MA.

(U) Related Activities:

- (U) Program Element #0602702F, (Command, Control, & Communications)
- (U) Program Element #0603789F, (C3I Advanced Development)
- (U) Program Element #0207412F, (Tactical Air Control System Improvements)
- (U) Program Element #0603260F, (Intelligence Advanced Development)
- (U) Program Element #0208010F, (Joint Tactical Communications)
- (U) Program Element #0207438F, (Theater Battle Management C4I).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2317 Tactical Air Information Production Distribution:

Project transitions advanced communications technology in support of Theater Battle Management (TBM) command and control enhancements. Project develops systems that provide increased interoperability, survivability, and control for communications networks interfacing from base communications to deployed elements of the global Defense Information System Network (DISN); demonstrates networking technologies to improve theater deployed communications; and transitions technologies developed under the Theater Extension Network portion of the DoD Global Grid initiative into the existing Air Force operational tactical network. Beginning in FY 1994, this project includes funding and tasks consolidated from PE 0303126F, Long Haul Communications, including the Secure Survivable Communications Network (SSCN).

(U) FY 1992 Accomplishments:

- (U) Completed Enhanced Multinet Gateway (EMG) testing and transferred prototypes to the Technology Insertion Center at Scott AFB IL for evaluation.
- (U) Development of the SSCN project begun in PE 33126F.

(U) FY 1993 Planned Program:

- (U) Initiate development of the Integrated Multi-Level Secure Communication Services (IMCS) prototype that allows integrated voice/data/video services of allows varying levels of secure data be accessed on the same network.
- (U) Continued development of the SSCN in PE 33126F.

(U) FY 1994 Planned Program:

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Program Element: #0603617F
PE Title: Command, Control, & Communications
(C3) Applications

Budget Activity: #5 - Communications
and Intelligence

- (U) Continue development of the IMLSCS prototype and begin preliminary integration with CTAPS.
- (U) Continue development of the SSCN project begun under PE 33126F to support theater deployed communications.
- (U) Initiate development of a tactical/strategic interface to assure global reachback of forward deployed SSCN to National Command Authorities.
- (U) Continue development of a security concept of operations (CONOPS) for the interface of the Defense Message System (DMS) to the theater.

(U) Work Performed By: All tasks in this program are managed through Rome Laboratories, Griffiss AFB, NY through Rome Laboratories, Griffiss AFB, NY and Electronic Systems Division, Hanscom AFB, MA. Contractors include Rome Research Corporation, Rome NY; Stanford Telecommunications Incorporated, Reston VA; GTE, Needham MA; Harris Corporation, Melbourne FL; Signatron Incorporated, Lexington MA; Motorola, Scottsdale AZ; Raytheon, Sudbury MA; National Communications Systems, Washington DC; MITRE Corporation, Bedford MA; and Computer Engineering Associates, Avon MA.

(U) Related Activities: See Project 2314.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2321, Tactical Battle Information Management:

This project is the R&D pipeline that feeds efforts to upgrade existing TBM C4I programs. It prototypes an Advanced Planning System (APS) decision aid. APS will supply combat planners with an automated capability to pull together the information on resources, weaponeering options, and the current battle situation that will reduce time to generate the Air Tasking Order (ATO) by a factor of ten. A force level execution decision aid (FLEX) will provide automated support for the dynamic air combat retasking process. The combination of these capabilities will provide the foundation for an automated Air Operations Center (AOC, formerly TACC). This project also performs rapid prototyping to address the requirements and technology for theater missile defense using existing and planned capabilities.

(U) FY 1992 Accomplishments:

- (U) Began full installation of APS in TAF theaters.
- (U) Provided preliminary Functional Common Core software to TAF theaters for interim use.

(U) FY 1993 Planned Program:

- (U) Initiate planning for FLEX combat operations automated support module development.
- (U) Complete Advanced Planning System development and integration with CTAPS.

(U) FY 1994 Planned Program:

- (U) Initiate FLEX advanced development.
- (U) Initiate theater missile defense prototyping to investigate how to integrate sensor improvements (e.g., Synthetic Aperture Radar (SAR) and Moving Target Indicator (MTI)) into automated C3 applications.

(U) Work Performed By: See Project 2314.

(U) Related Activities: See Project 2314.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

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Program Element: #0603617F
PE Title: Command, Control, & Communications
(C3) Applications

Budget Activity: #5 - Communications
and Intelligence

- (U) International Cooperative Agreements: APS has been approved for release to Saudi Arabia as a component in the Peace Shield Foreign Military Sales program. Release to other countries is under evaluation.
4. (U) Project 3804, TAF System Integration:
Project provides systems engineering to address system level issues associated with integration of C3I elements with command and control enhancements to Theater Battle Management (TBM) systems.
- (U) FY 1992 Accomplishments:
- (U) Completed the long-term MLS plan begun in FY 1991.
 - (U) Initiated development of system level plans for Tactical Battle Management (TBM) prototypes and their integration into the operating theaters.
- (U) FY 1993 Planned Program:
- (U) Complete TBM system level planning and begin to establish a system integration testing capability.
- (U) FY 1994 Planned Program:
- (U) Initiate development of system integration testing to include theater intelligence systems and other service TBM interfaces.
- (U) Work Performed By: See Project 2314.
- (U) Related Activities: See Project 2314.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603707F

Budget Activity: #2 - Advanced Technology

PE Title: Weather Systems Advanced Development

Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2688 Weather Support Technology	2320	2786	2702	Cont	TBD
2781 Weather Radar Technology	400	400	400	Cont	TBD
4026 Centralized Support Technology	<u>2005</u>	<u>1816</u>	<u>1350</u>	<u>Cont</u>	<u>TBD</u>
Total	4725	5002	4452	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program demonstrates new technologies for Air Force and Army weather support forces and their operational customers worldwide. Technologies include new data manipulation and forecasting techniques to improve the accuracy and efficiency of weather support to battlefield commanders and peacetime training operations. The program also provides new technologies to improve centralized space/weather support capabilities at the Air Force's Global Weather Central and Space Forcecast Center.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2688, Weather Support Technology: This project improves the Air Force's ability to gather, integrate, and forecast target weather information in data-denied battle areas. This is accomplished through the demonstration of tactical automated weather observation sensors, techniques to fuse weather data from different sources and times into a single "best available" analysis, and weather forecast models to address various levels of in-theater data availability.

(U) FY 1992 Accomplishments:

- (U) Completed a single-station weather forecast model for limited data regions.
- (U) Completed a new technique to fuse various sources of battlefield weather data for in-theater analyses.
- (U) Developed tactical weather sensors to measure key battlefield parameters.
- (U) Demonstrated new version of a model that assesses weather impacts on electro-optical weapon systems performance.
- (U) Demonstrated new capability for measuring and using infrared (IR) visibilities to support operational IR navigation and weapon systems.

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Program Element: #0603707F

Budget Activity: #2 - Advanced Technology

PE Title: Weather Systems Advanced Development

Development

(U) FY 1993 Planned Program:

- (U) Scale-down a global forecast model to optimize for theater applications.
- (U) Develop and incorporate high-value target detection criteria in a model that assesses weather impacts on electro-optical weapon systems performance.
- (U) Incorporate global terrain features into an enhanced version of the above model and demonstrate application to combat mission planning.
- (U) Complete the development of a tactical weather observation sensor.

(U) FY 1994 Planned Program:

- (U) Develop a new theater forecast model and compare to the scaled-down global model to determine which is best suited for battlefield operations.
- (U) Demonstrate battlefield uses of the tactical weather observation sensor.
- (U) Complete/demonstrate an upgraded version of the electro-optical weapon systems performance model.
- (U) Develop/test a new model for severe weather forecasting.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFMC's Phillips Laboratory, Hanscom AFB, MA. High-value target modeling is being done by Wright Laboratory, Wright-Patterson AFB, OH. The top five contractors are: Science and Technology Corp., Hampton, VA; Battelle Labs, Columbus, OH; Hughes STX Corp., Lanham, MD; Transportation Systems Center, Cambridge, MA; and Georgia Institute of Technology, Atlanta, GA.

(U) Related Activities:

- (U) Program Element 0305111F, Weather Service.
- (U) Program Element 0305160F, Defense Meteorological Satellite Program.
- (U) Program Element 0602101F, Geophysics.
- (U) Program Element 0604707F, Weather Systems Engineering Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2781. Weather Radar Technology: This project develops new technologies to fully exploit the capabilities of new operational DOD doppler weather radars. These technologies could be used by the Air Force to better observe and forecast severe weather, such as wind shear, tornadoes, and hail.

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Program Element: #0603707F

Budget Activity: #2 - Advanced Technology

PE Title: Weather Systems Advanced Development

Development

(U) FY 1992 Accomplishments:

- (U) Developed tornado prediction software and demonstrated to user.

(U) FY 1993 Planned Program:

- (U) Complete aircraft icing detection and automated hail detection algorithms.
- (U) Complete a hurricane windfield characterization algorithm.

(U) FY 1994 Planned Program:

- (U) Complete a storm-front location algorithm.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFMC's Phillips Laboratory, Hanscom AFB, MA. The only contractor is Hughes STX Corp., Lanham, MD.

(U) Related Activities:

- (U) Program Element 0305111F, Weather Service.
- (U) Program Element 0602101F, Geophysics.
- (U) Program Element 0604707F, Weather Systems Engineering Development.
- (U) Joint DOD/DOC/DOT Next Generation Weather Radar Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4026, Centralized Support Technology: This project develops technology for space forecasting models for the earth's neutral atmosphere, ionosphere, and magnetosphere needed to provide critical support to Air Force surveillance, communications, and other satellite assets. This project also develops new global and theater weather forecast techniques to improve the Air Force's capability to provide centralized weather support to fixed-site and deployed weather forces worldwide.

(U) FY 1992 Accomplishments:

- (U) Completed a neutral atmospheric model to predict satellite drag at altitudes between 140-1500 kilometers.
- (U) Completed an upper atmospheric model which characterizes hazardous spacecraft environments.
- (U) Completed a global cloud model for use by centralized forecast facilities.

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Program Element: #0603707F

Budget Activity: #2 - Advanced Technology

PE Title: Weather Systems Advanced Development

Development

(U) FY 1993 Planned Program:

- (U) Complete a wide-band ionospheric scintillation model to improve predictions of satellite communications outages.
- (U) Develop initial version of an advanced space forecast model to improve predictions of hazardous space environments for space vehicles.
- (U) Complete a neutral atmospheric model to predict satellite drag at altitudes between 90-140 kilometers.

(U) FY 1994 Planned Program:

- (U) Complete an enhanced global cloud model to improve cloud predictions at centralized forecasting facilities.
- (U) Complete a magnetospheric model for prediction of satellite anomalies.
- (U) Complete an improved ionospheric model to predict communications outages and support radar tracking of satellites and missiles.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFMC's Phillips Laboratory, Hanscom AFB, MA. The two contractors are: Assurance Technology Corp., Carlisle, MA; and Amptek Inc., Bedford, MA.

(U) Related Activities:

- (U) Program Element 0305111F, Weather Service.
- (U) Program Element 0305160F, Defense Meteorological Satellite Program.
- (U) Program Element 0602101F, Geophysics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603714F
PE Title: DOD Physical Security Equipment - Exterior

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
0003 Improved Miniature Intrusion Detection System (IMIDs)	730	525	500	0	1,755
0005 Active Denial	0	0	2,471	Cont	TBD
Total	730	525	2,971	Cont	TBD

Note: The Air Force normally receives RDT&E funds from OSD PE 0603228D for these types of projects. However, these two projects are being funded through PE 0603714F to satisfy Air Force unique requirements. The remaining Air Force physical security requirements will continue to be funded by PE 0603228D.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element supports the advanced development of the Department of Defense Base and Installation Security System, a standardized set of components, interfaces, and methods for creating exterior physical security systems. It provides for advanced development of system components in three functional areas: detection, command and control, and imaging. Developing systems in these areas will help satisfy the Department of Defense's need for a family of standardized, modular equipment which can be integrated into multiple system configurations. Each configuration will provide a level of security consistent with the deployment mode, threat level, and sensitivity of the asset being protected. The resulting equipment increases the ability of security forces to detect and intercept terrorists and improves the utilization of existing manpower by increasing mobility. The projects in this program element normally transition to Engineering and Manufacturing Development in Program Element 0603228D, DOD Physical Security Equipment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY1994

1. (U) Project 0003, Improved Miniature Intrusion Detection System: This project provides advanced development efforts for a sensor system that will detect an intruder(s) in covert and relocatable environments while emphasizing mobility and minimum manpower requirements for protecting non-nuclear assets. The primary focus is on developing low cost, expendable sensor systems with increased data communications capabilities that provide multiple verification of intrusions at non-nuclear weapons storage locations. Additionally the program will provide a capability to store previous sensor alarms which allows the security police to increase their coverage areas with no increase in existing manpower.

(U) FY 1992 Accomplishments:

- (U) Conducted studies to investigate/evaluate various combinations of commercial and developed equipment for use as a sensor data communications system
- (U) Evaluated enhancements to hand-held annunciators so they can be used to protect non-nuclear assets.

(U) FY 1993 Planned Program:

- (U) Continue development of low cost communications and annunciation subsystems.
- (U) Investigate options for increasing the operating frequencies of component sensors, adding a capability to save previous alarms in hand-held monitors, and increasing the number of sensors that can be monitored by the Miniature Intrusion Detection System (MIDS).

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Program Element: #0603714F

Budget Activity: #4 - Tactical Programs

PE Title: DOD Physical Security Equipment - Exterior

- (U) FY 1994 Planned Program:
- (U) Complete investigation of low cost sensors with demonstrations of several candidate systems.
 - (U) Complete development of selected improvements to MIDS in preparation for transitioning to final design, prototyping, and testing of components.
- (U) Work Performed By: This project is managed by the Electronic Security and Communication Systems Directorate, Electronic Systems Center, Hanscom AFB, MA. Engineering assistance for this project will be provided by Arthur D. Little, Inc., Cambridge, MA.
- (U) Related Activities:
- (U) Program Element 0603228D, DOD Physical Security Equipment.
 - (U) Program Element 0207588F, Air Base Ground Defense
 - (U) Program Element 0207589F, Base Physical Security System
 - (U) The Physical Security Equipment Action Group (PSEAG) coordinates the activities of the Services and Defense Nuclear Agency on development and acquisition of electronic security equipment.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands):
- (U) Other Procurement/BSA, WSC: 6304, 834130
 - (U) Procurement (BA 03, P-1 117):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	30,879	30,676	32,395	Cont	Cont

Quantities: Multiple items, various quantities (BPAC includes funds for IMIDs components as well as SCOPE SHIELD radios, several annunciators, InfraRed sensors, Closed Circuit TV cameras, microwave fence sensors, buried line sensors, seismic sensors, various displays, and other electronic security equipment).

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 0005, Active Denial: This project provides for the development of a system that will automatically detect and deny an intruder(s) access to nuclear weapons in storage. It will improve security of nuclear weapons while reducing cost and reliance on manpower to deny access. Current techniques and equipment are manpower intensive. They provide Security Police forces a capability to detect an intruder(s) with limited options to deny access (usually by intervening with a significant number of personnel). This new system will automatically detect an intruder and then deny access to nuclear weapons storage areas by applying incremental penalties. These penalties will increase in severity as the intruder(s) gets closer to the weapons storage area. The system is expected to significantly reduce Security Police manpower requirements by integrating directed energy devices with complementary delay equipment (detection, surveillance, and command and control components). When fielded the system will minimize reliance on barriers, sensors, conventional firearms and personnel to repel intruders. If the system is not developed and fielded Security Police forces will continue to rely on large numbers of personnel to repel intruders from nuclear weapons storage areas. This project is an FY94 new start. It is a delta package intended to accelerate development efforts on complementary systems to provide an automated denial capability for Security Police forces. It is the Air Force's number one physical security project and has been endorsed by the DoD Physical Security Equipment Action Group (PSEAG).

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Program Element: #0603714F
PE Title: DOD Physical Security Equipment - Exterior

Budget Activity: #4 - Tactical Programs

- (U) FY 1993 Planned Program: Not Applicable
- (U) FY 1994 Planned Program:
 - (U) Perform a system requirements analysis based on ACC Mission Need Statement 025-87 and its associated Operational Requirements Document
 - (U) Conduct the first of two directed energy technology demonstrations that designed to show the capabilities of directed energy in denying intruders access to weapons storage areas by physically repelling then using a concept of "incremental penalty".
 - (U) Conduct a review of existing access delay technology to identify candidate subsystems.
 - (U) Evaluate low cost, less complex access delay equipment (such as sonic denial, gravel falls, sticky foam, concertina wire, etc.) which may either complement or substitute for some directed energy elements.
 - (U) Develop several system alternative concepts which combine existing and emerging technologies. The thrust of this effort is to identify alternate solutions with their attendant capabilities, risks, and costs.
 - (U) Initiate various studies and analyses including interoperability, safety, environment studies, and logistics supportability.
- (U) Work Performed By: This project is managed by the Electronic Security and Communication Systems Directorate, Electronic Systems Center, Hanscom AFB, MA. Laboratory support for the project is provided by the Directed Energy Division, Armstrong Laboratory, Brooks AFB, TX, and Phillips Laboratory, Kirtland AFB, NM. The Human Systems Division, Brooks AFB, TX, will conduct research and analysis on human health aspects associated with this project.
- (U) Related Activities:
 - (U) Program Element 0603228D, DOD Physical Security Equipment.
 - (U) Program Element 0207588F, Air Base Ground Defense
 - (U) Program Element 0207589F, Base Physical Security System
 - (U) The Physical Security Equipment Action Group (PSEAG) coordinates the activities of the Services and Defense Nuclear Agency on development and acquisition of electronic security equipment.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603723F

Budget Activity: #2 - Advanced Technology

PE Title: Civil and Environmental Engineering Technology

Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2103 Environmental Quality Advanced Technology	2,249	3,090	3,084	Cont	TBD
2104 Air Base Operability Advanced Technology	5,737	5,470	4,051	Cont	TBD
3037 Noise and Sonic Boom Impact Technology	<u>3,004</u>	<u>1,992</u>	<u>1,300</u>	<u>Cont</u>	<u>TBD</u>
Total	10,990	10,552	8,435	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates advanced technologies to: (1) solve Air Force-unique environmental problems to comply with all laws while maintaining readiness, conducting realistic training, and deploying new weapons; (2) enhance air base survival and recovery from chemical/biological or conventional attack; (3) apply cost-effective technology advances to air base operation; and (4) develop models and methodologies to predict aircraft noise and sonic boom stimuli and describe its effects on humans, animals, and structure. The Environmental Quality Technology goals are: 50% reduction in generation of selected hazardous waste (\$13M savings annually in operations and maintenance costs); cost-effective control technology for industrial emissions from aircraft painting operations (\$6M savings annually); and 95% faster downwind hazard corridor prediction for disaster response. The Civil Engineering technology development goals are: wartime survivability of critical air base facilities and utilities; air base damage assessment in minutes versus hours; rapid repair of air base facilities, utilities, and operating surfaces; and 100% improvement in post-attack fire suppression and crash rescue. The Noise and Sonic Boom Impact Technology goal is rapid environmental impact assessment and mitigation for Air Force flying operations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2103, Environmental Quality Advanced Technology: This project develops and demonstrates advanced technologies to solve environmental restoration problems, reduce hazardous emissions from weapon systems, minimize Air Force industrial waste, and eliminate toxic pollutant releases from Air Force operations.

(U) FY 1992 Accomplishments:

- (U) Developed technology to recover metals from sludge.
- (U) Demonstrated replacements for cyanide strippers and bench scale alternative processes to electroplating.
- (U) Developed fuel spill assessment/remediation manual.

(U) FY 1993 Planned Program:

- (U) Demonstrate alternative solvents for paint stripping to conform to new Environmental Protection Agency constraints.
- (U) Validate use of hot water to safely remove rocket propellants.
- (U) Develop response model for gaseous fuel dispersion over uneven terrain for space operations ranges.

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Program Element: #0603723F
PE Title: Civil and Environmental
Engineering Technology

Budget Activity: #2 - Advanced Technology
Development

- (U) FY 1994 Planned Program:
 - (U) Demonstrate fire training facility waste treatment for air and water emissions compliance.
 - (U) Validate technologies to contain contaminants during aquifer cleanups.
- (U) Work Performed By: The Armstrong Laboratory, Tyndall AFB, FL, manages the program. The major contractors are: EG&G, Idaho Falls, ID; ACUREX, Mountain View, CA; Martin Marietta, Denver, CO; ASI, Albuquerque, NM; and Mountain States Engineering, Butte, MT.
- (U) Related Activities:
 - (U) PE 0602102F, Materials.
 - (U) PE 0602202F, Human Systems Technology.
 - (U) PE 0602203F, Aerospace Propulsion.
 - (U) PE 0602206F, Civil Engineering and Environmental Quality.
 - (U) PE 0603211F, Aerospace Structures.
 - (U) PE 0603716D, Strategic Environmental Research and Development Program.
 - (U) PE 0604708F, Other Operational Equipment.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 2104, Air Base Operability Advanced Technology: This project develops and demonstrates advanced technologies to build air base facilities and utilities that can survive chemical, biological, and conventional weapons attack. It also develops advanced technologies to: construct and repair runways and air mobile structures; perform damage assessment and repair; perform crash rescue and suppression of aircraft and air base post-attack fires; and perform critical peacetime civil engineering construction, maintenance, and repair.
 - (U) FY 1992 Accomplishments:
 - (U) Developed heating, ventilation, and air conditioning (HVAC) chemical/biological agent filter system.
 - (U) Demonstrated a lightweight, efficient mobile heat pump to support rapid deployment forces.
 - (U) Developed design concept for modular hardened shelters to protect rapid mobility equipment and personnel.
 - (U) FY 1993 Planned Program:
 - (U) Demonstrate an automated utility damage assessment system for oil and lubricant storage and distribution networks.
 - (U) Develop an advanced pavement system analyzer for quick battle damage repair.
 - (U) Demonstrate automatic fire suppression turret for spreading extinguishant during crash and rescue operations.
 - (U) FY 1994 Planned Program:
 - (U) Demonstrate fuel cell and superconductive magnetic energy storage technologies to reduce dependency on purchased electrical power.
 - (U) Design HVAC systems to survive conventional attacks.
 - (U) Demonstrate rapid stabilization for runway construction.
 - (U) Validate smoke-reducing fuel to simulate jet fuel for live fire training.

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Program Element: #0603723F
PE Title: Civil and Environmental
Engineering Technology

Budget Activity: #2 - Advanced Technology
Development

(U) Work Performed By: The Armstrong Laboratory, Tyndall AFB, FL, manages the program. The major contractors are: Applied Research Associates, Albuquerque, NM; New Mexico Engineering Research Institute, Albuquerque, NM; EML Research, Hudson, NH; Research Associates of Syracuse, Syracuse, NY; and Harris Group, Reston, VA.

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602206F, Civil Engineering and Environmental Quality.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603307F, Air Base Operability Advanced Development.
- (U) PE 0604617F, Air Base Operability.
- (U) PE 0604703F, Aeromedical/Chemical Defense Systems Development.
- (U) PE 0604708F, Other Operational Equipment.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3037, Noise and Sonic Boom Impact Technology: This project develops and demonstrates assessment and prediction technologies to evaluate impact of noise from aircraft operations as directed by the National Environmental Policy Act. It also develops technologies for active noise control. Today, noise impact assessments take two to five years to complete. Improving this capability is essential for timely response to public concerns, preparation of accurate environmental impact statements, and mitigation of aircraft noise.

(U) FY 1992 Accomplishments:

- (U) Demonstrated Assessment System for Aircraft Noise (ASAN) Beta version for operational test.
- (U) Developed design specifications for a monitor of human responses to various levels of noise -- to better quantify effects of noise on humans.

(U) FY 1993 Planned Program:

- (U) Perform ASAN Beta test and transition to Major Commands.
- (U) Produce demonstration version of human response monitor.
- (U) Deliver to training route planners at major commands, the results of the study on the effects of aircraft noise on caribou and bighorn sheep.

(U) FY 1994 Planned Program:

- (U) Develop ASAN training module.
- (U) Complete study to assess the impact of aircraft noise on predator/prey interactions and deliver effects model.
- (U) Complete sleep disturbance study and human annoyance from impulse noise study.
- (U) Investigate technologies regarding Active Noise Reduction for application to such environments as cockpits and airfields.

(U) Work Performed By: The Armstrong Laboratory, Wright-Patterson AFB, OH, manages the program. The major contractor is BB&N, Canoga Park, CA.

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Program Element: #0603723F

Budget Activity: #2 - Advanced Technology

PE Title: Civil and Environmental
Engineering Technology

Development

(U) Related Activities:

(U) PE 0602202F, Human Systems Technology.

(U) PE 0602203F, Aerospace Propulsion.

(U) PE 0602206F, Civil Engineering and Environmental Quality.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603726F

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)
Subsystems Integration

Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2810 Advanced Cartographic Applications	1,587	1,815	2,900	Cont	TBD
2863 Integrated Photonics	4,340	4,380	7,020	Cont	TBD
3192 Advanced Optical Storage Technology	2,458	2,643	4,962	Cont	TBD
4263 Network Management for Theater Extension	0	0	1,000	Cont	TBD
Total	8,385	8,838	15,882	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates C3 technologies in the areas of spatial data manipulation of digital cartographic databases, photonics technology, optical disk storage/processing of digital information, and advanced satellite communications terminal technology. These technologies provide increased storage, processing, and transmission of digital data that contains unlimited data content, such as the cartographic global grid data. Increased FY 1994 funding supports the increased emphasis on C3 technologies that support the theater commander.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2810, Advanced Cartographic Applications: This project is the single Air Force technology program to develop, demonstrate, and transition techniques and software to meet all weapon systems requirements for digital spatial data relating to earth surface topology (terrain, threat, and feature mapping) data. This data is used for mission planning, navigation, targeting, and terrain analysis. This project provides generic interrogation techniques, as well as, standard applications software for digitally processed spatial data products that contain positional information of earth surface topology and imagery. Project milestones, demonstrations, and transitions are directly responsive to validated requirements of Air Force users and system developers.

(U) FY 1992 Accomplishments:

- (U) Demonstrated Common Mapping System (CMS) baseline unit-level cartographic capability; began development to provide user options with standardized cartographic applications to optimize system performance.
- (U) Demonstrated an advanced cartographic application configuration management tool kit to track software development, changes, and documentation.

(U) FY 1993 Planned Program:

- (U) Demonstrate Defense Automated Warning System integrated with the CMS and Common Mapping Took Kit.
- (U) Complete CMS standardized cartographic data/applications server demonstration.
- (U) Demonstrate the upgraded hardware of the CMS cartographic database and applications interface.

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Program Element: #0603726F

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)
Subsystems Integration

Development

- (U) Demonstrate software to consolidate multiple cartographic applications and optimize speed, accuracy, and reliability.

(U) FY 1994 Planned Program:

- (U) Demonstrate a geographic information handling system that will provide a single, unified, full function cartographic server network.
- (U) Begin a multiple database integration that will provide automated update capabilities for standard Air Force mapping, charting, geo-positioning, and imagery databases.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Grumman Data System, Woodbury, NY; Sterling Software Inc., Bellevue, NE; and Synetics Corp., Rome, NY.

(U) Related Activities:

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2863, Integrated Photonics: Current electronic systems are susceptible to electromagnetic interference, electromagnetic pulse, and radio frequency interference. Size constraints, speed, and reliability also limit traditional electronic systems. Photonics-based systems, which process information in the form of light (photonics) signals, will provide major improvements in tactical and strategic battle management systems by providing small size, high capacity, high performance, survivable alternatives. This program demonstrates advanced hardware technology in optical signal processing, adaptive processing, optical control of phased arrays, integrated electro-optic networks, optical transmission, and nonlinear optical processing.

(U) FY 1992 Accomplishments:

- (U) Demonstrated optical time/phase shifter networks to improve performance, efficiency, and anti-jam capability for phased array antennas for airborne phased array antenna surveillance system applications.
- (U) Demonstrated a 0 to 500 megahertz distortion free fiber optic link to remote receive antenna systems.

(U) FY 1993 Planned Program:

- (U) Continue development of a one giga-operations per second optical signal processor for secure, jam resistant radar and communications.
- (U) Continue development of an optical frequency synthesizer; a critical component for optical control to improve performance of phased array antennas.
- (U) Initiate development of an integrated optic control system for surveillance and communication phased array antennas.
- (U) Design a one trillion operations per second optical signal processor for automatic combat identification of ground and airborne targets using multispectral surveillance systems.
- (U) Continue development of a distortion-free analog fiber optic link at 2 to 18 gigahertz to remote receive antenna systems.

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Program Element: #0603726E

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)

Development

Subsystems Integration

(U) FY 1994 Planned Program:

- (U) Demonstrate a 2 to 18 gigahertz radio frequency optical transmission system.
- (U) Demonstrate integrated optical modules for optical control of a phased array antenna system.
- (U) Demonstrate critical modules for an integrated C3 optical processing system.
- (U) Demonstrate a one giga-operations per second optical signal processor for secure jam-resistant radar and communications.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Hughes Aircraft, Malibu, CA; Westinghouse, Baltimore, MD; Texas Instruments, Callas, TX; Lincoln Laboratory, Hanscom AFB, MA; and United Technologies, Hartford, CT.

(U) Related Activities:

(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3192, Advanced Optical Storage Technology: Present C3 systems lack the low-cost, high density data storage capacity and performance required for advanced operations and near-real-time sensor inputs. This project develops a family of erasable data optical storage systems with the high capacity/speed input/output needed. Included is a single 5.25-inch optical disk recorder/player, a single 14-inch optical disk recorder/player, and a ten-disk automated optical jukebox. The 5.25-inch technology is for fighter aircraft for airborne access to mission-oriented data and the digital terrain system. The 14-inch technology is for on-board sensor data storage in electronic surveillance aircraft.

(U) FY 1992 Accomplishments:

- (U) Completed detailed electronics design and fabrication/assembly of the 14-inch optical disk modules.
- (U) Performed subsystem component integration and check-out of the 14-inch optical disk.

(U) FY 1993 Planned Program:

- (U) Complete the integration and flight demonstration of a 14-inch optical disk.
- (U) Conduct 14-inch optical disk system user assessment.
- (U) Complete the ten-disk automated optical "jukebox" preliminary design.
- (U) Complete 14-inch optical disk user assessment to prepare system for technology transition.

(U) FY 1994 Planned Program:

- (U) Initiate assembly of the ten-disk optical "jukebox" for deployable and command level sensor applications.
- (U) Complete 14-inch optical disk technology.
- (U) Design an optical three-dimensional memory to demonstrate next-generation improvements in on-line storage and computer memory.

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Program Element: #0603726E

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)
Subsystems Integration

Development

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: General Electric, Camden, NJ; and Kodak, Rochester, NY.

(U) Related Activities:

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4263, Network Management for Theater Extension: This project will develop the network management and optical switching technology to allow the extension of the DOD concept of a secure and survivable theater communications network. This project will develop advanced network management technologies to allow autonomous, adaptive control within theater despite little homogeneity, constant change, threats, and traffic surges. Since this control will be provided with less than perfect information regarding the status of the network at any given time, technologies will be developed to solve distributed resource allocation problems by spotting trends and isolated patterns associated with threats. Network management functions to be developed include: real-time connectivity restoral via multiple radio frequency bands; negotiated restoral via commercial or allied operated networks; allocation of traffic responsibilities between the space, airborne, and terrestrial parts; real-time service modification; and real-time development and enforcement of service and information policies. All of these functions will be attained in an environment where problems of flow control, buffering, and congestion are significant due to anticipated high data transfer rates. This project will also extend the present electronic asynchronous transfer mode (ATM) switching techniques to the optical domain. The resulting weight and power reduction with vastly increased performance will be critical for next-generation theater command and control systems.

(U) FY 1992 Accomplishments: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Initiate optical networking technology program to extend electronic ATM switching technologies.
- (U) Develop commercial/military management information interface that will support high data transfer rates and information surges.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors will be competitively selected.

(U) Related Activities:

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603728F
PE Title: Advanced Computer Technology

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2527 Software Life Cycle Tools	3,266	3,498	7,240	Cont	TBD
2530 Distributed Systems Reliability and Survivability	2,279	2,255	3,990	Cont	TBD
2532 Knowledge-Based Systems	3,248	10,276*	7,389	Cont	TBD
4264 Network/Computer Systems Integration Technology	<u>0</u>	<u>0</u>	<u>1,000</u>	<u>Cont</u>	<u>TBD</u>
Total	8,793	16,029	19,619	Cont	TBD

* In FY 1993, Congress added \$6 million to upgrade a high-speed hypercube computer for speech modulation research.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates software technologies that: reduce cost and risk; increase programmer productivity/efficiency; improve quality of software and computer architectures required in combat systems; develop certification methodology for reusability of software components; and develop computer security methods to assure Air Force systems are tamperproof and can process multilevel secure data. The increasing complexity of Air Force systems coupled with the availability of smaller, more powerful computer hardware has multiplied the use of digital computers and resulted in an unprecedented demand for software. Development and support of software are labor intensive processes and their spiraling costs are a function of increased demand. Also, the proliferation of computers in Air Force weapon systems dictates they be more reliable and survivable in the battlefield environment. The requirement for survivable tactical, strategic, and space computing systems has driven the need for automatic integration/ interoperability of multiple processing elements, automatic redistribution of data and functions, and location of independent access of data. Distributive processing techniques that can dynamically reconfigure assets to accommodate lost components or nodes are required to ensure mission critical command and control functions are survivable. Increased FY 1994 funding supports increased emphasis on command, control, and communications technologies that support the theater commander.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2527, Software Life Cycle Tools: This project develops, evaluates, and transitions advanced software engineering technology to improve quality and productivity for Air Force weapon systems. The project develops advanced software tools and incorporates commercial off-the-shelf software for: software and system process oriented life cycle support environments; techniques for requirements elicitation, analysis, and specification for reduced system errors; software quality measurement and assessment technology for product and process improvement; and software engineering technology to exploit high performance computer architectures.

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Program Element: #0603728F
PE Title: Advanced Computer Technology

Budget Activity: #2 - Advanced Technology Development

(U) FY 1992 Accomplishments:

- (U) Produced a design for a software engineering workstation that incorporates the latest in computer science technology.
- (U) Introduced a knowledge-based approach into the requirements engineering process resulting in a high productivity technology demonstration workstation.
- (U) Established a Software Quality Technology Transfer Consortium at the Rome Laboratory under a Cooperative Research and Development Agreement.

(U) FY 1993 Planned Program:

- (U) Develop technology to augment the enhanced Software Life Cycle Support Environment (E-SLCSE) to enable both acquisition and support activities to address hardware, software, and firmware.
- (U) Develop advanced test techniques for improved software fault tolerance and the production of high confidence, robust software with designed-in quality.
- (U) Initiate an effort for a knowledge-based technology demonstration workstation to capture corporate knowledge on domain specific applications for use in developing, analyzing, and specifying requirements for follow-on or improved systems.

(U) FY 1994 Planned Program:

- (U) Complete an enhanced version of E-SLCSE with an improved user interface and compatibility with commercial database management systems.
- (U) Complete methodology for defining and managing the process selected for mission critical software production and post-deployment support.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Industrial Software Systems, Inc., Austin, TX; Software Productivity, Melbourne, FL; Martin Marietta, Denver, CO; Harris Corporation, Melbourne, FL; and IITRI, Lanham, MD.

(U) Related Activities:

- (U) PE 0604740F, Computer Resource Management.
- (U) PE 0701112F, Inventory Control Point Operation.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2530. Distributed Systems Reliability and Survivability: The ability of an information handling system to dynamically respond to changes in load or configuration created by crisis situations is critical to all future command, control, and communications systems. The system must respond rapidly and automatically to the situation even though the computing elements may be geographically dispersed over a wide area. This project develops the distributed information handling technology to provide interoperability among dispersed command centers (fixed, mobile, airborne), allowing Air Force commanders immediate access to information at any location. The result is a seamless information handling environment from the data sources to the information users. The system will operate in an "information pull" mode where the user requests for information are filled without explicit action on the part of the user to locate, retrieve, or merge data.

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Program Element: #0603728E
PE Title: Advanced Computer Technology

Budget Activity: #2 - Advanced Technology Development

(U) FY 1992 Accomplishments:

- (U) Completed a distributed computing design to support Single Integrated Operational Plan replanning. It integrated workstations, parallel processors, and data base servers into a distributed planning environment. It exhibited the location transparency, uniform access, and ease of integration.

(U) FY 1993 Planned Program:

- (U) Develop a real-time distributed computing capability for geographically dispersed centers.
- (U) Develop a survivable computing cluster capable of continued operation in the presence of overlapping and intermittent failures of components.
- (U) Develop performance metrics and an instrumentation capability to evaluate operation of distributed computing systems.

(U) FY 1994 Planned Program:

- (U) Develop a global resource management capability based on expert system technology to provide uniform characterization of all information handling system resources.
- (U) Develop a distributed database management architecture capable of simultaneously handling text, graphics imagery, and video data.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Bolt Beranek and Newman, Cambridge, MA; SRI International, Menlo Park CA; General Electric Corp., Valley Forge, PA; Syracuse University, Syracuse, NY; and Honeywell Corp., Minneapolis, MN.

(U) Related Activities:

(U) PE 0604740F, Computer Resource Management.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2532, Knowledge-Based Systems: This project develops software that automates the problem solving process associated with human reasoning. It has three major thrusts. The first, knowledge-based systems engineering, provides software tools and techniques to develop and evaluate knowledge-based systems, including capabilities to construct and engineer large scale knowledge-based systems. The second, knowledge-based planning, develops artificial intelligence (AI) planning capabilities to support rapid, accurate, and efficient plans creation and modification; including increased cost-effectiveness in diverse planning applications involving decision support to employment and deployment planning, logistics planning, and resource allocation and scheduling processes. The third, knowledge-based software, exploits knowledge-based methods to effect orders of magnitude improvement in software development and support activities. In FY 1993, Congress added \$6 million to upgrade a high-speed hypercube computer for speech modulation research.

(U) FY 1992 Accomplishments:

- (U) Demonstrated planning tools for rapidly evaluating alternatives for joint operations transportation planning.

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Program Element: #0603728E
PE Title: Advanced Computer Technology

Budget Activity: #2 - Advanced Technology Development

- (U) Demonstrated a software prototyping environment including artificial intelligence (AI)-based planning/ scheduling tools and test data for crisis planning.
- (U) Demonstrated benefits of an AI approach for full life cycle development/maintenance of mission critical software using air space management/air traffic control models.

(U) FY 1993 Planned Program:

- (U) Complete a laboratory testbed capability to aid and support the development of large scale artificial intelligence software systems.
- (U) Demonstrate integration of planning and scheduling tools to support the generation, evaluation, and modification of crisis action plans to U.S. Transportation Command (USTRANSCOM).
- (U) Enhance the Common Prototyping Environment software and testbed supporting development, integration, demonstration, and test and evaluation of knowledge-based planning and scheduling tools and technology.
- (U) Demonstrate capability for distributed collaborative planning between crisis action cells and USTRANSCOM in Non-Combatant Evacuation Operations (NEO).

(U) FY 1994 Planned Program:

- (U) Demonstrate knowledge-based software development methods for optimal design and development of Ada software modules.
- (U) Demonstrate integrated tools for transportation planning and scheduling, derived from experimentation within the Common Prototyping Environment software and USTRANSCOM testbed.
- (U) Extend the USTRANSCOM NEO planning and scheduling toolset to support additional kinds of operations and a deployed joint task force.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: BBN Laboratories Inc., Cambridge, MA; GE CRD, Schenectady, NY; SRI, Menlo Park, CA; Ascent Technologies, Cambridge, MA; GE ATL, Moorestown, NY; and Anderson Consulting, Chicago, IL.

(U) Related Activities:

- (U) PE 0604740F, Computer Resource Management.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4264. Network/Computer Systems Integration Technology: This project will develop the technology to provide an unprecedented integration of a communications network management system and computing resources. This project will develop the technology to provide for the creation of real-time access paths to transfer information based on the demand of the distributed asynchronous processors that are part of any distributed computing network, such as may be found in a theater-level command, control, and communications (C3) system. This problem is especially heightened when using collateral forces with even wider dissimilarities in computing and network resources, and associated policies on the access of these resources. Interactive, multimedia (i.e., voice, data, image, video) distributed processing technologies (e.g., real-time mission planning) will participate in the allocation and responsiveness of high capacity information transfer networks. Particular

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Program Element: #0603728F
PE Title: Advanced Computer Technology

Budget Activity: #2 - Advanced Technology Development

emphasis in this project will be placed on the maintenance of acceptable application performance despite stresses on the underlying deployed communications network. Advanced technologies will be developed to allow multilevel secure processes to operate over multilevel secure deployed networks.

(U) FY 1992 Accomplishments: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Begin development of high performance asynchronous transfer mode service module for distributed computing networks.
- (U) Begin design of theater extension network security architecture for multilevel secure networks.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Contractors will be competitively selected.

(U) Related Activities:

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603742E
 PE Title: Combat Identification Technologies

Project Number: 2597
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Non-Cooperative Identification Subsystems	23,674	18,169	28,759	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The U.S. Tactical Air Forces have a critical requirement to positively identify enemy, friendly, and neutral aircraft enabling the battlefield commander to effectively manage and control the air battle and minimize fratricide.

Such consequences have resulted in the definition of the following stringent operational requirements for a combat ID system:

This program element develops, demonstrates, promising new noncooperative target identification (NCTI) technologies (e.g., Ultra-High Range Resolution (UHRR) radar) to meet the above cited requirements. The two primary programs associated with this technology are HAVE CENTAUR and HAVE LION.

These efforts reflect the Air Force's increased emphasis and priority on NCTI.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY1992 Accomplishments:

- (U) Completed HAVE CENTAUR Preliminary Design Review.
- (U) Started Phase II hardware/software design and test planning.
- (U) Refocused HAVE LION

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Program Element: #0603742F
PE Title: Combat Identification Technologies

Project Number: 259Z
Budget Activity: #4 - Tactical Programs

- (U) Conducted
 - (U) Completed
 - (U) Upgraded Computer Aided Electronic Warfare Information System (CAEWIS) to support emitter identification data bases for operational aircraft.
 - (U) Conducted application studies and demonstrations.
 - (U) Conducted Man-in-the-loop non-cooperative target identification (NCTI) simulations at Theater Air Command and Control Simulation Facility (TACCSF).
 - (U) Demonstrated NCTI technologies
2. (U) FY1993 Planned Program:
- (U) HAVE CENTAUR Critical Design Review (2QTRFY94) - decision point to proceed with hardware/software modifications, integration, and testing.
 - (U) HAVE CENTAUR risk reduction (1QTRFY93-ongoing) for
 - (U) Continue to perform application studies and demonstrations on
- (U) (3QTRFY93)
3. (U) FY1994 Planned Program:
- (U) Large funding increment required due to bulk of Dem/Val activity for HAVE CENTAUR and HAVE LION.
 - (U) HAVE CENTAUR increased funding for advanced technology demonstration and initial hardware/flight test vehicle interface design, development, and fabrication. System software design, development, coding and testing. Additionally, surface-to-air data collection and synthetic signature generation architecture development.
 - (U) HAVE LION Critical Design Review (4QTRFY94)- decision point to proceed with hardware/software modifications, integration, and testing.
 - (U) HAVE LION Dem/Val continues and detailed test planning begins.
 - (U) Continue Planning for the transition of these techniques to a variety of platforms is initiated.
 - (U) Study impact of as a platform.
 - (U) Continue to
 - (U) Establish a formal process for documenting, managing, validating, and disseminating
4. (U) Program to Completion: Continues.

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Program Element: #0603742E
PE Title: Combat Identification Technologies

Project Number: 2597
Budget Activity: #4 - Tactical Programs

D. (U) Work Performed By: Hughes Aircraft, Los Angeles, CA; Westinghouse, Baltimore, MD; and Veda, Dayton, OH. Management: Air Force Wright Laboratory, Wright Patterson AFB, OH and Rome Laboratory, Griffiss AFB, NY.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: TPS-75/ALQ-128 integration study completed FY 92. investigation program expanded in FY 93 to include evaluation of differing aircraft classes.
2. (U) SCHEDULE CHANGES: Three month schedule slip in HAVE CENTAUR/HAVE LION due contract negotiations and efforts to match funding profile.
3. (U) COST CHANGES: Reduction of \$.931M in FY 93 due to general reductions.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 304-79, Air-to-Air Target Identification, 30 Jun 79.
- (U) TAF SON 305-79, Surface-to-Air Target Identification, 30 Jun 79.
- (U) TAF SON 304-83, Advance Tactical fighter/Air-to-Air, 9 Nov 84.
- (U) TAF SON 320-82, Advanced Tactical Surveillance System, 15 May 86.
- (U) Joint Mission Need Statement (JMNS) for Combat Identification, 13 Apr 92.
- (U) Multi-sensor Fusion Requirements for AWACS & Fighters, ACC/DRP ltr, 17 Feb 93.

G. (U) RELATED ACTIVITIES:

- (U) PE #0603203F Advance Avionics for Aerospace Vehicles
- (U) PE #0603789F C3I Technology Development
- (U) PE #0602204F Aerospace Avionics
- (U) PE #0602702F Command, Control, and Communications
- (U) All cooperative and non-cooperative ID programs are reviewed by the Tri-Service General Officer Steering Committee for Combat ID (GOSC-ID).
- (U) PE #0604725F Combat Identification Systems

H. (U) OTHER APPROPRIATION FUNDS: Not applicable.

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Program Element: #0603742E
PE Title: Combat Identification Technologies

Project Number: 2597
Budget Activity: #4 - Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) HAVE CENTAUR:	PDR	3QTRFY92
	CDR	2QTRFY94
	Flight Test	1QTRFY96
2. (U) HAVE LION:	PDR	2QTRFY93
	CDR	4QTRFY94
	Field Test	2QTRFY96
3. (U)	Doppler Demonstration:	3QTRFY94

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603789F

Budget Activity: #2 - Advanced Technology Development

PE Title: Command, Control, and Communications (C3)
Advanced Technology Development

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2333 Surveillance Radar Technology	1,711	1,975	4,056	Cont	TBD
2335 Theater Battle Management C3 Technology	2,828	3,055	7,300	Cont	TBD
3433 Laser Communications	2,469	3,199	1,638	Cont	TBD
4072 Indirect Non-Cooperative Target Identification (NCTI) Advanced Development	707	944	3,572	Cont	TBD
4265 Theater Extension Network Advanced Technology Development	<u>0</u>	<u>0</u>	<u>500</u>	<u>Cont</u>	<u>TBD</u>
Total	7,715	9,173	17,066	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This advanced technology development program integrates and demonstrates ground-, air-, and space-based C3 technologies required to maintain Air Force capabilities in a fast-paced, sophisticated, high threat, and intense jamming environment. Better surveillance/communications technology must be developed to counteract an enemy's jamming of our surveillance capabilities and to restore critical surveillance and communications capabilities to maintain our combat edge. The technologies developed in this program include: detection and identification of low-observable/stealth aircraft at long ranges under combat conditions; reliable, secure, jam resistant communications, including satellite crosslinking techniques; and battle management technology that assimilates this crucial C3 information into a form that facilitates and supports the military leader's combat decisions in response to the dynamics of the battlefield. Increased FY 1994 funding supports increased emphasis on C3 technologies that support the theater commander.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2333, Surveillance Radar Technology: Current Air Force tactical surveillance systems (E-3, TPS-43, TPS-75) are limited in their ability to detect and track multiple targets in today's electronic warfare environment. This project develops and demonstrates advanced antenna mainbeam nulling, adaptive electronic counter-countermeasure (ECCM) signal processing, fusion algorithms, and conformal array technologies to restore low-observable/stealth surveillance capabilities in jammed sectors. It develops technology improvements for components and subsystems for actual surveillance systems, such as the Airborne Warning and Command and Control System (AWACS) and Ground Tactical Air Control Systems (GTACS), that when integrated provide improved low cross-section target detection in an electronic countermeasures (ECM)/clutter environment. It develops smart cueing and the merging of target imagery with signals information.

(U) FY 1992 Accomplishments:

- (U) Completed the Conformal Array Radar Technology (CART) component development and subsystem integration and evaluated partially populated conformal array sidelobe performance.

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Program Element: #0603789F

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)
Advanced Technology Development

Development

- (U) Installed and evaluated automatic techniques for improved mainlobe antijamming on the C-Band radar.

(U) FY 1993 Planned Program:

- (U) Initiate plans for integrating Conformal Array Radar Technology (CART) experimental radar into a static aircraft ground-based airframe testbed.
- (U) Complete installation and evaluation of automatic mainbeam nulling techniques to a rotating antenna radar.
- (U) Incorporate additional CART modules for the airborne configuration to half fill the array to provide better beam shape control for the sidelobe/mainlobe electronic counter-countermeasure (ECCM) tests and adaptive space time processing algorithm evaluation.

(U) FY 1994 Planned Program:

- (U) Complete compact antenna range tests and preliminary static ground-based on-aircraft interference tests.
- (U) Complete CART ground tests.
- (U) Begin design and fabrication of low frequency array for detection of low cross-section targets. This technology is applicable to upgrade existing and new radars.
- (U) Begin development of programmable smart jamming countermeasure technologies.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Raytheon, Wayland, MA; Intercon, Alexandria, VA; and Rome Research, New Hartford, NY.

(U) Related Activities:

(U) PE 0602204F, Aerospace Avionics.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2335. Theater Battle Management C3 Technology: This program develops the technology for contingency/joint operations C3 capability. Fundamental to the program are the concepts of force deployment, sustainment, and employment. Dynamic, extremely hostile battlefield environments demand near instantaneous transmission and processing of vast amounts of C3 information for real-time decision making. This project develops/ integrates low probability of intercept/antijam signal processing; modular, programmable, multi-level secure communications; secure and distributed networks; advanced displays and interfaces; and battle management decision support capabilities for survivable, distributed C3 facilities. These technologies, pursued as joint-Service initiatives, are integrated into the Rome Laboratory in-house Theater Battle Management C3 test environment to apply a systems approach to evaluate and demonstrate technology.

(U) FY 1992 Accomplishments:

- (U) Demonstrated a network management technology that uses all available transmission media to efficiently transfer mission support data.

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Program Element: #0603789E

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)

Development

Advanced Technology Development

- (U) Enhanced communications networks with improved Multi-Level Secure and survivable networking for continuation of communications in the face of jamming, destruction, system failure, etc.
- (U) Provided rapid prototyping technology to Force Level Execution (a dynamic replanning capability supporting theater combat operations) functionality, ensuring required decision assistance/automation for combat operations.
- (U) Continued development of multimode/multiband/programmable radio baseline technologies for insertion into an advanced radio demonstration.

(U) FY 1993 Planned Program:

- (U) Initiate a joint-Service baseline advanced radio technology demonstration.
- (U) Complete a network management technology that will allow all dispersed comn and center elements to interchange all forms of information as though they were collocated.
- (U) Define system design parameters for an integrated and interactive planning function for air operations centers.
- (U) Complete development of force level execution and demonstrate in theater battle management (TBM) C3 test environme..t.

(U) FY 1994 Planned Program:

- (U) Conduct preliminary joint-Service demonstration of advanced radio development and continue development of advanced radio technologies.
- (U) Demonstrate an operations-information integration system that will show a battle management planning function that is both integrated and interactive.
- (U) Demonstrate an experimental secure wide area communications network.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Rome Research Corp., New Hartford, NY; Hazeltine, Long Island, NY; Advance Decision Systems, Mountain View, CA; and GTE, Needham, MA.

(U) Related Activities:

- (U) PE 0603617F, C3 Applications.
- (U) PE 0603737D, Balanced Technology Initiative.
- (U) PE 0603006A, C3 Technology.
- (U) PE 0602232N, C3 Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3433, Laser Communications: The Air Force needs long-range, very high data rate satellite communication links. Current technology cannot meet current Air Force requirements. This project is developing flight-qualified hardware and a brassboard heterodyne laser communications system (LASERCOM) using frequency modulation that is more efficient than current pulsed-type systems. The system will ground demonstrate an inter-satellite data networking capability that can improve real-time global connectivity, reduce dependence on ground relay sites, increase coverage time for low-orbit satellites, and enhance survivability by shared redundancy.

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Program Element: #0603789F

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)
Advanced Technology Development

Development

(U) FY 1992 Accomplishments:

- (U) Fabricated and flight qualified the electromagnetic (EM) opto-mechanical subsystem.
- (U) Completed development of the test environment for the EM subsystem.
- (U) Integrated and tested all available EM subsystems as available.

(U) FY 1993 Planned Program:

- (U) Test the acquisition, tracking, and communication systems of the integrated EM subsystem.
- (U) Fabricate/flight qualify fiber-coupled receiver modules for a laser communications system.
- (U) Provide design/technology baseline of a laser communications system to future operational users.

(U) FY 1994 Planned Program:

- (U) Integrate fiber-coupled receiver modules into the EM subsystem.
- (U) Test acquisition, tracking, and communication systems of the integrated EM subsystem.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: MIT-Lincoln Lab, Hanscom AFB, MA; Optical Corp. of America, Garden Grove, CA; and Electrofusion, Fremont, CA.

(U) Related Activities:

(U) PE 0603250F, Lincoln Laboratory.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4072, Indirect Non-Cooperative Target Identification (NCTI) Advanced Development:

The Air Force must be able to positively identify hostile aircraft in combat to gain maximum advantage of beyond-visual-range weapons and ensure a first-shot, first-kill capability. Indirect NCTI capabilities ensure long-range high-confidence identification (ID) to control the air battle and provide fighters with the necessary ID information to use beyond-visual-range weapons. This project develops and integrates the necessary suite of complementary passive and active NCTI capabilities for command and control platforms such as Airborne Warning and Control System (AWACS) and the national, theater, and tactical sensors.

(U) FY 1992 Accomplishments:

- (U) Defined parameters/interfaces to incorporate advanced state-of-the-art sensor fusion technology and real-time information into the NCTI architecture.
- (U) Performed analysis to define parameters and interfaces to incorporate real-time information into the NCTI architecture.
- (U) Integrated advanced NCTI radar signal modulation techniques into the testbed in order to demonstrate the increased probability of positive ID to users.

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Program Element: #0603789F

Budget Activity: #2 - Advanced Technology Development

PE Title: Command, Control, and Communications (C3)
Advanced Technology Development

(U) FY 1993 Planned Program:

- (U) Design integrated traditional and bistatic electronic support measures systems to demonstrate Non-Cooperative Target Identification (NCTI) advantages.
- (U) Integrate and test rudimentary bistatic electronic countermeasure-type algorithms to evaluate airframe identification.
- (U) Initiate coding of an advanced multi-sensor fusion algorithm for installation and test on multiple sensors.

(U) FY 1994 Planned Program:

- (U) Initiate test and evaluation of bistatic air frame identification (ID) algorithms.
- (U) Integrate and test voice processing algorithms in fusion tests.
- (U) Complete test of correlation interface with the fusion algorithm.
- (U) Couple interface and test sensors with their associated ID processing algorithms and the main fusion algorithm.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Syracuse Research, Syracuse, NY; Technology Services Corp., Trombull, CT; Harris Corp., Melbourne, FL; and Calspan Corp., Buffalo, NY.

(U) Related Activities:

(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.

(U) PE 0603742F, Combat Identification Technology.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4265. Theater Extension Network Advanced Technology Development: This project will develop the ability to link the national command authorities to the deployed forces regardless of location and to maintain the connectivity in peace and throughout all phases of conflict. Network fabric composed of electronic switching and transmission systems will be developed and demonstrated. This project will provide the switching and transmission technology required to extend into any theater of interest, at any time, in support of any mission. The program will use the existing worldwide commercial fiber optic communications infrastructure to provide wide-bandwidth DOD communications. Theater extension refers to the addition of the survivable links and switching functions to allow communications from the point, where commercial presence ends, to the warfighting elements. In order to leverage scarce DOD resources, commercial off-the-shelf telecommunications technologies will be used to the maximum extent possible. This project will develop the advanced networking technologies such as militarized asynchronous transfer mode (ATM) switching which, coupled with fiber optic communication and very high data rate radios, will enable highly effective and efficient command and control in wartime. New integrated switching technologies combining voice, data, and video will foster radically new methods and procedures in command and control. Robust and survivable communications protocols will be developed that can maintain network structure and provide uninterrupted flow of vital information while maintaining compatibility with established international standards. Wideband, programmable radio frequency and optical transmission technology will be integrated into this switching fabric to allow a surge to remote and mobile users in theater.

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Program Element: #0603789F

Budget Activity: #2 - Advanced Technology

PE Title: Command, Control, and Communications (C3)
Advanced Technology Development

Development

(U) FY 1992 Program: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Begin development of 155.2 megabit per second militarized asynchronous transfer mode (ATM) switch compatible with Navy shipboard and Army mobile subscriber equipment.
- (U) Develop robust survivable communication protocols that can maintain uninterrupted flow of command and control information over the network.

(U) Work Performed By: Project is managed by Rome Laboratory, Griffiss AFB, NY.
Contractors will be competitively selected.

(U) Related Activities:

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201F

Budget Activity: #4-Tactical

PE Title: Aircraft Avionics Equipment DevelopmentProgramsA. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2257 Standard Avionics/Joint Services Review Committee (JSRC) Initiatives	2,260	2,363	2,513	Cont	TBD
2258 Standard Inertial Navigation Unit (INU)	3,800	2,551	96	0	26,849
2297 Embedded Computer Software Standardization (ECSS)	1,000	1,322	0	TBD	TBD
2560 High Order Language Control Facility (LCF)	500	472	0	TBD	TBD
2658 Avionics Architecture Implementation and Support (AAIS)	400	472	0	TBD	TBD
3264 Standard Flight Data Recorder (SFDR)	3,000	2,929	289	0	37,359
4017 Compass/Attitude & Heading Reference System (C/AHRS)	<u>3,079</u>	<u>4,985</u>	<u>3,739</u>	<u>Cont</u>	<u>TBD</u>
Total	14,039	15,094	6,637	TBD	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element explores and develops standard avionics architectures and equipment which will reduce acquisition and support costs, increase weapon system performance and availability, and foster technology evolution and insertion for operational force improvements. The scope is both domestic and international. Reliability and Maintainability (R&M) play a major role in the identification of specific development efforts within this element as evidenced by the evolution of the Standard Inertial Navigation Unit, the Standard Central Air Data Computer, the Standard Flight Data Recorder and the Compass/Attitude & Heading Reference System. Joint avionics development efforts are pursued through participation in/support of the Joint Service Review Committee (JSRC) and as the DoD delegated Lead Standardization Activity for Avionics. Current initiatives include standard Flight Data Recorder, Compass/Attitude & Heading Reference System and Solid State Barometric Altimeter. Development, enhancement, and maintenance of MIL-STD-1750/1815 embedded computer software support tools are supported. Ongoing support activities, such as the High Order Language Control Facility and Avionics Architecture Implementation and Support program, are activities that both help ensure maintenance of credible software standardization.

Program Element: #0604201F
 PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical
Programs

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2257, Standard Avionics and Joint Services Review Council (JSRC) Initiatives:

Project identifies/develops candidate systems for standardization in the Air Force; through the JSRC, and as DoD Lead Service Activity (LSA) for Avionics, identifies/develops candidate systems for joint services standardization; maintains/updates the Air Force Avionics Roadmap, Avionics Planning Baseline, and avionics database; supports international avionics initiatives.

(U) FY 1992 Accomplishments:

- (U) Continued front-end work to identify avionics standardization opportunities through Air Force, JSRC, and DoD LSA processes.
- (U) Initiated Modular Avionics Systems Architecture (MASA) demonstration/validation program.
- (U) Initiated Low Probability of Intercept (LPI) radar altimeter program.
- (U) Completed Avionics Acquisition Cost Estimating System (AACES) development.
- (U) Continued Solid State Barometric Altimeter development.
- (U) Continued High Speed Data Bus (HSDB) certification & Common Weather Radar Program.
- (U) Initiated Tanker/Transport Common Radar (TTCR) Program.

(U) FY 1993 Planned Program:

- (U) Publish updated AF Avionics Roadmap.
- (U) Continue front-end work to identify avionics standardization opportunities through Air Force, JSRC, and DoD LSA processes.
- (U) Continue MASA demonstration/validation and TTCR development; initiated T-38 conceptual demonstration activities.
- (U) Review participation in Joint Low Probability of Intercept (LPI) radar altimeter program.
- (U) Continue HSDB certification.
- (U) Continue TTCR program.
- (U) Complete limited demonstration of embedded Global Positioning System (GPS) with an Inertial Navigation System (INS).

(U) FY 1994 Planned Program:

- (U) Continue front-end work to identify avionics standardization opportunities through Air Force, JSRC, and DoD LSA processes.
- (U) Continue MASA demonstration/validation and TTCR development.
- (U) Update Avionics Roadmap to include all Tri-Service requirements.
- (U) Begin formal SPO participation in International Avionics Development effort - Allied Standard Avionics Architecture Council (ASAAC).

Program Element: #0604201F
 PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical Programs

- (U) Continue development of embedded GPS/INS.
- (U) Initiate Functional Avionics Life Cycle Cost Model (FALCCM) program.

(U) Work Performed By: The Common Avionics Directorate, Subsystems Program Office, Aeronautical Systems Center (ASC)/Air Force Materiel Command (AFMC), Wright-Patterson AFB OH, provides program management. Major contractors are Draper Labs, Cambridge MA; ARINC, Annapolis MD; TASC, Fairborn OH; and Atlantic Research Corp, Fairborn OH.

(U) Related Activities:

- (U) PE #0603253F, Advanced Avionics Integration.
- (U) PE #0604609F, RAMTIP.
- (U) PE #0708026F, PRAM.
- (U) The Joint Service Review Committee (JSRC), under the Joint Logistics Commanders, coordinates similar efforts. PEs #64203N (US Navy) and 64201A (US Army) also support JSRC.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: International collaborative avionics efforts are currently monitored via the Allied Standard Avionics Architecture Council (ASAAC).

2. (U) Project 2258, Standard Inertial Navigation Unit (INU): Develops Air Force standard form, fit, function (F3) medium accuracy (0.8nm/hr) INU for A-7, C-130, F/RF-4, F-15, F-16, F/EF-111, F-117, MH-53J, and Army OV-1, enhanced accuracy (0.4nm/hr) INU for the F-117A, and precision accuracy (SPA) (0.2nm/hr) INUs for MC-130, AC-130, and Joint STARS. Applies ring laser gyro (RLG) technology in Air Force standard F3 medium accuracy INU. Major remaining effort is development of INU depot support equipment(SE).

(U) FY 1992 Accomplishments:

- (U) Developed maintenance & test sets and software for RLG INU SE.
- (U) Integrated RLG on JSTARS aircraft.
- (U) Developed Enhanced Accuracy Specification for Special Operations Forces (SOF).

(U) FY 1993 Planned Program:

- (U) Develop maintenance & test sets and software for SPA INU.
- (U) Continue work on precision accuracy INU SE development and depot

Program Element: #0604201F
 PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical
Programs

residual tasks.

(U) FY 1994 Planned Program:

- (U) Complete system development activities; transform residual tasks to depot.

(U) Work Performed By: Major contractors are Honeywell, Clearwater FL, and Litton, Woodland Hills CA (medium accuracy RLG INU); and Kearfott Little Falls NJ (precision accuracy INU). The Common Avionics Division, Subsystems Program Office, ASC/AFMC, Wright-Patterson AFB OH, provides program management.

(U) Related Activities:

- (U) PE #0701112F, Inventory Control Point Operations.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2297, Embedded Computer Software Standardization: Develop support software to implement standardization efforts such as MIL-STD-1815 (Ada Programming Language) and MIL-STD-1750A (Air Force Standard 16 Bit Instruction Set Architecture Computer).

(U) FY 1992 Accomplishments:

- (U) Established sustaining engineering contract for Ada/1750A production quality compiler.

(U) FY 1993 Planned Program:

- (U) Establish software architectural requirements for next generation, avionics hardware.

(U) FY 1994 Planned Program:

- (U) No tasks planned in FY94 due to project funding reductions.

(U) Work Performed By: Major contractor is Boeing Military Airplane Company, Wichita KS (subcontracted to Intermetrics Inc, Cambridge MA). The Common Avionics Division, Embedded Computer Standardization Program Office, ASC/AFMC, Wright-Patterson AFB OH, provides program management.

(U) Related Activities:

- (U) PE #0602204F, Aerospace Avionics.

Program Element: #0604201F
 PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical
Programs

- (U) PE #0603226F, DoD Common Programming Language, Advanced Development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U)Other Appropriation Funds: Not Applicable.

(U)International Cooperative Agreements: Not Applicable.

4. (U)Project 2560. High Order Language Control Facility (LCF): Acts as a service organization to support USAF and DoD High Order Language (HOL) standardization efforts. HOL standardization assists in reducing computer software acquisition, operation, and maintenance costs by facilitating the development of reliable, maintainable, and reusable software. The HOLCF is responsible for centralized control of the JOVIAL J73 programming language, and DoD Ada programming language standardization.

(U)FY 1992 Accomplishments:

- (U) Continued validation of JOVIAL and Ada compilers (ongoing process as developmental enhancements occur with software)

(U)FY 1993 Planned Program:

- (U) Complete validation of JOVIAL and Ada compilers.

(U)FY 1994 Planned Program:

- (U) No tasks planned in FY94 due to project funding reductions.

(U)Work Performed By: The Computer Operations Directorate, ASC/AFMC, Wright-Patterson AFB OH, provides program management.

(U)Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U)Other Appropriation Funds: Not Applicable.

(U)International Cooperative Agreements: Not Applicable.

5. (U)Project 2658. Avionics Architecture Implementation and Support (AAIS): Supports Systems Engineering Avionics Facility, which provides and develops avionics architectural standards (e.g., MIL-STD-1553 and MIL-STD-1760); performs validation testing/engineering support for new/existing architectures, and investigates/develops new standards.

Program Element: #0604201F
 PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical
Programs

(U) FY 1992 Accomplishments:

- (U) Performed MIL-STD-1553B and MIL-STD-1750 testing.
- (U) Completed MIL-HDBK-1760 development.
- (U) Continued 32-bit computer architecture standard development.
- (U) Performed initial High Speed Data Bus testing.
- (U) Defined High Speed Fiber Optic Data Bus (HSFODB) test requirements.
- (U) Supported ANSI/MIL-STD-1815A, Ada Programming Language, and MIL-HDBK-1553, Rev B, NATO STANAG & ASCC standard development.

(U) FY 1993 Planned Program:

- (U) Complete MIL-STD-1553B and 1750A testing.
- (U) Complete support of 32-bit computer architecture standard.

(U) FY 1994 Planned Program:

- (U) No tasks planned in FY94 due to project funding reductions.

(U) Work Performed By: The Common Avionics Division, Subsystems Program Office, ASC/AFMC, Wright-Patterson AFB OH, provides program management.

(U) Related Activities:

- (U) PE #0603226F, DoD Common Programming Language, Advanced Development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: NATO STANAG version of MIL-STD-1760 is in development. Supports information exchange with Air Standardization Coordinating Committee (ASCC).

6. (U) Project 3264. Standard Flight Data Recorder (SFDR): A Joint Service Review Committee-sponsored initiative to develop a standard crash survivable flight data recorder for various Air Force aircraft.

(U) FY 1992 Accomplishments:

- (U) Delivered flight test Low Rate Initial Production (LRIP) units for F-111, F-15, B-52, and C-135.
- (U) Began C-130 and C-141 SFDR LRIP deliveries.
- (U) Continued SFDR depot Support Equipment (SE) development.
- (U) Completed FCA/PCA/HQA of core system.
- (U) Awarded follow-on production contract/Milestone III approval.

Program Element: #0604201F
 PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical
Programs

(U) FY 1993 Planned Program:

- (U) Continue development of SFDR depot SE.
- (U) Complete LRIP deliveries.
- (U) Make first full rate production delivery.
- (U) Complete Data Transfer Interface Unit (DTIU) development.

(U) FY 1994 Planned Program:

- (U) Continue development of SFDR depot SE.

(U) Work Performed By: Major contractor is Smiths Industries, Grand Rapids MI. The Common Avionics Division, Subsystems Program Office, ASC/AFMC, Wright-Patterson AFB OH, provides program management.

(U) Related Activities: There are other Army and Navy contractors for Flight Data Recorder Systems, none however, with the capability of the SFDR. There is no unnecessary duplication of effort within the Air Force or the DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 4017. Compass/Attitude & Heading Reference System (C/AHRS): Joint Service Review Committee-supported program. Develops functional replacement systems for several existing compass systems and AHRSs for use in various Air Force and Navy aircraft. Tri-Service MOA includes the Army as a potential user.

(U) FY 1992 Accomplishments:

- (U) Completed study/aircraft definition phase for core aircraft, and System Requirements Review (SRR); evaluated initial design.

(U) FY 1993 Planned Program:

- (U) Completed Preliminary Design Review (PDR) - Nov 92, and Critical Design Review (CDR) planned for Jul 93.
- (U) Continue study/definition phase for potential AF and Army platforms.

(U) FY 1994 Planned Program:

- (U) Continue design/dev of units for qualification/durability and flight testing.
- (U) Begin fabrication of units for flight/qual/durability testing.

(U) Work Performed By: Major contractor is Smiths Industries, Grand Rapids MI. The Common Avionics Division, Subsystems Program Office, ASC/AFMC, Wright-Patterson AFB OH, provides program management.

Program Element: #0604201F

Budget Activity: #4-Tactical

PE Title: Aircraft Avionics Equipment Development

Programs

(U)Related Activities: There exists a tri-service (Army, Navy, Air Force) Memorandum Of Agreement (MOA) governing the development of the C/AHRS program. There is no unnecessary duplication of effort within the Air Force or the DoD.

(U)Other Appropriation Funds: Not Applicable.

(U)International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604212F
PE Title: Aircraft Equipment Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES: (\$ in Thousands):

Project Title & Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	TO COMPLETE	TOTAL PROGRAM
1010 War Reserve Material (WRM) Fuel Tank System	0	0	1,532	1132	2,664
1926 Aircraft Windshield Development	3,919	3,804	0	0	7,723
Total	3,919	3,804	1,532	1132	10,387

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops, tests and evaluates subsystem equipment to satisfy operational needs for updating Air Force aircraft. Updates are required due to changing threats, equipment obsolescence and technical advancements, and to improve efficiency, effectiveness, and safety.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 1010. War Reserve Material (WRM) Fuel Tank System:

This project was initiated using funds from the Production, Reliability, Availability and Maintainability (PRAM) program and will transition to Engineering and Manufacturing Development (EMD) in PE 64212F beginning in FY 1994. Project 1010 is intended to replace the existing WRM external fuel tank on USAF tactical aircraft with a low cost system providing equal performance to the existing tank but with improved reliability, reduced assembly time, improved storage capability and lower support costs.

(U) FY 1992 Accomplishments:

- (U) Two requests for information packages were generated under the PRAM effort.

(U) FY 1993 Planned Program:

- (U) Release request for proposal.

(U) FY 1994 Planned Program:

- (U) Award EMD contract leading to prototyping, testing and down selecting to one contractor.
- (U) Conduct Preliminary Design Review/Critical Design Review.
- (U) Begin Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E).

(U) Work Performed By: The program is managed at Aeronautical Systems Center, Wright Patterson Air Force Base, OH. The contractor for the WRM Fuel Tank project will be determined at source selection.

(U) Related Activities:

- (U) PE #0708026F, Productivity, Reliability, Availability and Maintainability
- (U) PE #0207133F, F-16 Squadrons
- (U) PE #0207134F, F-15 Squadrons

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Program Element: #0604212F
PE Title: Aircraft Equipment Development

Budget Activity: #4 - Tactical Programs

(U) Other Appropriations Funds (\$ in Thousands):

(U) Aircraft Procurement; BSA 0704/WSC 000999; P - 1 Line # 99.

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Cost	0	0	0	56,100	56,100

(U) International Cooperative Agreements: Not Applicable

2. (U) Project 1926, Aircraft Windshield Development:

This project demonstrates emerging technologies to provide windshield systems with mission compatible hazard tolerance, optical quality, and a 50% reduction in life cycle costs.

(U) FY 1992 Accomplishments:

- (U) Transitioned B-1B extended life windshield to operational use.
- (U) Conducted flight evaluation of improved bird impact resistant T-38 windshield system.
- (U) Completed design review of F-16 advanced canopy and began prototype test and evaluation.
- (U) Completed design review of F15 prototype alternative transparency system and began test and evaluation.
- (U) Initiated development of removal-for-cause criteria for service-aged transparencies.

(U) FY 1993 Planned Program:

- (U) Begin Operational Test and Evaluation (OT&E) of B-1B windshields for the 1995-2000 missions.
- (U) Perform OT&E on F-15 alternative transparencies.
- (U) Complete development of removal-for-cause criteria for service-aged transparencies.
- (U) Apply durability validation technologies for competitive reprocurement of F-15, F-16, F-111 and B-1B transparencies.
- (U) Apply transparency service life tracking methodologies.
- (U) Transition T-38 bird resistant windshield and all-composite frame to operational use.
- (U) Initiate development of theory of electrostatic discharge phenomenon.
- (U) Initiate injection molded system for the F-15.

(U) FY 1994 Planned Program: Not Applicable

(U) Work Performed By: The program is managed at Aeronautical Systems Center, Wright Patterson AFB, OH. The contractor for Project 1926 is the University of Dayton Research Institute, Dayton, OH.

(U) Related Activities:

- (U) PE# 0602201F, Aerospace Flight Dynamics.
- (U) PE# 0603203F, Advanced Avionics for Aircraft.
- (U) PE# 0603211F, Aerospace Structural Materials.
- (U) PE# 0604201F, Aircraft Avionics Equipment.
- (U) PE# 0604226F, B-1B.

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Program Element: #0604212F
PE Title: Aircraft Equipment Development

Budget Activity: #4 - Tactical Programs

- (U) PE# 0207129F, F-111 Squadrons.
- (U) PE# 0207133F, F-16 Squadrons.
- (U) PE# 0207134F, F-15E Squadrons.
- (U) PE# 0804741F, Undergraduate Pilot Training.
- (U) PE# 0708026F, Productivity, Reliability, Availability and Maintainability.

(U) Other Appropriations Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements:

- (U) Data exchange Agreement AF-86-G-745 with the Federal Republic of Germany, Birdstrike Resistant Aircraft Component Design, Development and Evaluation.
- (U) Data Exchange Agreement AF-86-Aust-0710 with Australia, Birdstrike Resistant Aircraft Component Design, Development and Evaluation.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604218F

Budget Activity: #4 - Tactical

PE Title: Engine Model Derivative
Program (EMDP)

Programs

A. (U) RESOURCES (\$ in Thousands):

Project

<u>Number &</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To</u>	<u>Total</u>
<u>Title</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
2634 Engine Model Derivative Program	3,950	945	863	Cont	TBD
Total	3,950	945	863	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: EMDP is an engineering development program that provides the latest engine technology advances to current weapon systems and provides a framework for engine development for future systems such as Multirole Fighter (MRF) and A-X aircraft. EMDP contributes to system life extension, reduced life cycle cost, and enhanced performance. Enhanced performance is required to counter increases in system weight and increased threat capability. EMDP demonstrates derivative engine concepts incorporating advanced technology and components from government and contractor funded programs. EMDP demonstrates technology in performance, durability, operability, supportability, reliability, maintainability, and unique capabilities, such as thrust reversing and vectoring nozzles. These demonstrations are in prototype derivatives of existing engines prior to full scale development. Early demonstration of improved engine characteristics significantly reduces risk and shortens engine development and qualification, allowing quick, cost-effective response to weapon system needs. EMDP also evaluates candidate engines (commercial or military) to provide competitive engine opportunities. EMDP ensures the Air Force has propulsion alternatives to meet near-and far-term needs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) 2634, Engine Model Derivative Program: See paragraph B. above.

(U) FY 1992 Accomplishments:

- (U) Began Increased Thrust Derivative Engine (ITDE) design effort.
- (U) Began qualification effort of the 1000 lb thrust class engine for unmanned air vehicles.
- (U) Completed preliminary design efforts for the integrated propulsion module for the AGM-130E.
- (U) Continued examination of engine candidates and system needs.
- (U) Continued to analyze current engines for future derivative potential and revise roadmaps to meet MAJCOM requirements.

(U) FY 1993 Planned Program:

- (U) ITDE design effort redirected to Increased Performance Engine (IPE+) life extension and R&M capability improvements.
- (U) Complete qualification effort of the 1000 lb thrust class engine for unmanned air vehicles.
- (U) Initiate effort to support contractor demonstrations of thrust vectoring nozzles, low observables technology, advanced controls and accessories, and thrust growth for ITDE.
- (U) Continue examination of engine candidates and system needs.
- (U) Continue to analyze current engines for future derivative potential and revise roadmap to meet MAJCOM requirements.

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Program Element: #0604218F
PE Title: Engine Model Derivative
Program (EMDP)

Budget Activity: #4 - Tactical
Programs

(U) FY 1994 Planned Program:

- (U) Continue IPE+ design effort.
- (U) Continue efforts supporting contractor demonstrations of thrust vectoring nozzles, low observables technology, advanced controls and accessories, and thrust growth for ITDEs.
- (U) Continue examination of engine candidates and system needs.
- (U) Continue to analyze current engines for future derivative potential and revise roadmap to meet MAJCOM requirements.

(U) Work Performed By: EMDP is managed by the Subsystem System Program Office (SPO) at Aeronautical Systems Center, Wright-Patterson AFB OH. The contractors (and engines) involved are: Pratt & Whitney (P&W), West Palm Beach FL (F100, F117); General Electric Company (GE), Evendale OH (F110); Williams International, Walled Lake MI (FJ44, F107, F112, F121, P8300); Allison, Indianapolis IN (Model 150, 250 propfan, T56); Teledyne CAE, Toledo OH (235 propfan, Model 382-12, 318-1, 384-4A); and Garrett Corporation, Phoenix AZ (ETJ1081, F124/F125, F109).

(U) Related Activities:

- (U) PE #0603202F (Aircraft Propulsion Subsystem Integration)
- (U) PE #0603216F (Aerospace Propulsion and Power Technology)
- (U) PE #0602203F (Aerospace Propulsion)
- (U) PE #0708011F (Industrial Preparedness Program)
- (U) Activities conducted by the Army, the Navy, National Aeronautics and Space Administration, and propulsion industry Independent Research and Development (IR&D)
- (U) PE #0604268F, (Aircraft Engine Component Improvement Program) complements EMDP by addressing engine safety problems, service-revealed deficiencies, and improved reliability
- (U) The Air Force and the Navy have a broad memorandum of understanding for joint cooperative propulsion programs in areas of common interest
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604222E
 PE Title: Nuclear Weapons Support

Budget Activity: #6 - Defense Wide Mission Support

A. (U) RESOURCES (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
5708 Nuclear Weapons Support	4,556	4,161	4,330	Cont	TBD
4236 Engineering Analysis	<u>1,179</u>	<u>1,135</u>	<u>1,145</u>	<u>Cont</u>	<u>TBD</u>
Totals	5,735	5,296	5,475	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides funds for maintaining the core of Air Force nuclear weapon system expertise. Includes in-house technical capabilities, related contractual efforts, supplies and equipment, travel, and salaries of the Aeronautical Systems Center, Directorate of Nuclear Systems Engineering (OL-NS) civilian nuclear weapon specialists. Provides technical guidance for improved weapon development, stockpile management and retirement, compatibility, interoperability, safety, and security. Customers are: DoD, DOE, Defense Nuclear Agency, NATO, AF operational commands, Navy, AFMC, logistic centers, and AF Safety Agency. Includes funds to demonstrate bomb/warhead compatibility with delivery platforms. Supports U.S. Strategic Command and Air Combat Command (ACC) Required Operational Capability 16-71 (Peacekeeper), 12-76 [Air Launched Cruise Missile (ALCM)], 6-76 (B61 Strategic Bomb), 6-69 (B83 Modern Strategic Bomb), Strategic Command System Operational Requirements Document 13-82-111 and the Advanced Cruise Missile System. Participates in the planning and implementation of the Joint DoD-DOE Surety Plan. The plan documents nuclear weapon issues which can benefit from the application of risk assessment, data collection, and model development.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:1. (U) Project 5708. Nuclear Weapons Support:

Funds OL-NS/EN civilians to provide technical support for all new and fielded USAF Nuclear Weapon Systems.

2. (U) Project 4236. Engineering Analysis:

Funds OS-NL/EN Engineering Analysis performed on contract for all new and fielded Nuclear Weapons Systems.

(U) FY 1992 Accomplishments:

- (U) Assumed Lead Project Officer responsibilities for all USAF nuclear warheads.
- (U) Completed special study of SRAM warhead.
- (U) Supported three Phase 1 weapon concept studies.
- (U) Conducted Phase 3/4 studies of W61, W87, W89, and W91.
- (U) Completed Special Stockpile Improvement Review study.
- (U) Studied stockpile adjustments from DOE facility shortfalls.
- (U) Continued stockpile/retirement activities for ten nuclear weapons.
- (U) Completed eight major safety studies/reviews.
- (U) Developed and published new AMAC test requirements.
- (U) Maintained/updated nuclear weapon technical orders.
- (U) Conducted surety/integration activities for ICBMs.

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Program Element: #0604222E
PE Title: Nuclear Weapons Support

Budget Activity: #6 - Defense Wide Mission Support

- (U) Continued support for surety/compatibility for all programs.
- (U) Completed 24 Nuclear Certification Analysis/recommendation IAW AFR 122-3.
- (U) Reviewed and approved 7 operational certification to procedures changes.
- (U) Supported W87/78 Weapon System Safety Assessment Study.
- (U) Supported Congressional-chartered FARR study of all DoD Nuclear Weapon Systems.
- (U) Analyzed the DoD/DoE START Verification Technologies.
- (U) Completed ICBM replacement warhead phase I safety study.
- (U) Completed the draft MIL-STD-1816 (Weapon Systems, subsystems, and associated facilities and equipment nuclear certification) and associated data item description.

(U) FY 1993 Planned Program:

- (U) Complete B-2A nuclear compatibility test planning.
- (U) Complete B83-1 nuclear safety analysis.
- (U) Complete and publish intent unique signal report.
- (U) Complete studies on C2 periodic and surveillance testing requirements.
- (U) Support B-2A and C-17 nuclear weapons technical orders.
- (U) Provide technical support to NATO PA-200 operational safety review.
- (U) Complete and publish F-15E Pre-operational safety review.
- (U) Provide technical support to F-16 operational safety review.
- (U) Develop/certify nuclear tiedown configurations for Army Lance warhead secure containers.
- (U) Establish nuclear hardness database center.
- (U) Conduct analysis on MHU-204 trailer for the B-2A.
- (U) Complete C-141/C-130 PNAF safety study.
- (U) Support impact analysis of FARR study implementation.
- (U) Support W78/87 Weapon system safety assessment study.
- (U) Support weapon modernization and inactive reserve enhancement efforts.
- (U) Conduct project officer meetings on B53, W56, W62, W69, W78, W80, B83, W84, W85, and W87 weapons.
- (U) Provide support to DNA led Fire Resistant Enhancement Study.
- (U) Conduct B-83-1 Special design review and assistance group meeting.
- (U) Provide support for Joint Staff's inactive reserve storage/maintenance/retrofit issues study.
- (U) Brief RED team and provide support for RED team activities on W80 Warhead.
- (U) Provide support to SAF/AQQS regarding START I implementation planning.
- (U) Continue Nuclear Certification Analyses/recommendations IAW AFR 122-3.
- (U) Continue review of operational certification TO procedure changes.
- (U) Continue ongoing Pre-Phase 1, Phase 1, or Phase 2 studies.
- (U) Continue nuclear weapon safety studies and compatibility testing and analysis.
- (U) Continue support for Air Force nuclear weapon stockpile activities, retirements, and nuclear safe escape effort.
- (U) Continue nuclear hardness database center efforts.
- (U) Continue support of weapon modernization and inactive reserve enhancement efforts.
- (U) Continue support of START I and START II Treaty.

(U) FY 1994 Planned Program:

- (U) Continue FY 1993 level of effort.
- (U) Continue ongoing Pre-Phase 1, Phase 1, or Phase 2 studies.
- (U) Continue nuclear weapon safety and compatibility studies, compatibility testing and analysis.
- (U) Continue to support AF nuclear weapon stockpile activities, retirements, and nuclear safe escape effort.
- (U) Update and expand nuclear hardness data base center.
- (U) Continue support weapon modernization and inactive reserve enhancement efforts.
- (U) Continue support of START I and START II Treaty.

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Program Element: #0604222E
PE Title: Nuclear Weapons Support

Budget Activity: #6 - Defense Wide Mission Support

(U) Work Performed By: Aeronautical Systems Center, Directorate of Nuclear Systems Engineering.

(U) Related Activities:

- (U) PE 0604312F (ICBM Modernization)
- (U) PE 0101215 (Peacekeeper); PE 0101213 (MM II)
- (U) PE 0101213F (MM Squadrons)
- (U) PE 0604361F (ALCM); PE 0603319F (ACM); 0101120F (ACM)
- (U) PE 0101113F (B-52 Offensive Avionics System)
- (U) PE 0101118F (SRAM A)
- (U) PE 0101126F (B-1B); PE 0604226F (B-1B); PE 0101127 (B-2)
- (U) PE 0207130F/0207134F (F-15E Squadrons)
- (U) PE 0207590F Aircraft Stores Certification (Seek Eagle/nuclear).
- (U) There is no duplication of effort within the AF or DOD.

(U) Other Appropriation Funds (\$ In Thousands):

(U) DOE RD&T, production, and surveillance are funded separately in DOE TOA at \$1-3 billion plus per year.

(U) Cooperative Agreements: Non-US NATO agreements created on a weapon system by weapon system basis. NATO uses U.S. assets.

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FY 1994 BUDGET RDT&E SUMMARY

Program Element: # 0604226F
PE Title: B-1

Budget Activity: #1 - Strategic Programs

A. (U) RESOURCES BY PROJECT (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY92 Actual</u>	<u>FY93 Estimate</u>	<u>FY94 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
4143 Conventional Capabilities Improvements	0	35,300	86,300	866,900	988,500
1019 Electronic Countermeasures (ECM) Improvements	0	45,300	7,200	242,200	294,700
2731 Anti-Ice and Threat Analysis Group	<u>5,400</u>	<u>0</u>	<u>0</u>	<u>N/A</u>	<u>N/A</u>
Total	5,400	80,600	93,500	1,109,100	1,283,200

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE provides RDT&E funding required for the B-1 Conventional Mission Upgrade Program (CMUP). The Air Force Conventional Bomber Roadmap provides a plan for B-1s, together with B-2s and standoff B-52s, to provide theater commanders with long range air power in early days of potential future conflicts, as well as mass to support sustained in-theater air operations in combination with other forces. Project 4143 supports B-1 capability enhancements to improve aircraft effectiveness in conventional operations. Planned conventional capability improvements emphasize integrating conventional weapons, including advanced precision guided munitions. Specific B-1 conventional tasks currently planned include: adding an anti-jam secure-voice radio; integrating cluster bomb units (CBUs); integrating Joint Direct Attack Munition (JDAM 1/3), Joint Standoff Weapon (JSOW), and Tri-Service Standoff Attack Missile (TSSAM); incorporation of the MIL-STD-1760 interface; and computer memory and throughput upgrades for weapons stores management and long term reliability and maintainability improvements. This project also includes integration of Global Positioning Satellite (GPS) capability for use with weapons. Project 1019 provides for ECM improvements to B-1. Air Combat Command (ACC) requires B-1 ECM improvements in the areas of supportability, radar warning capability, and increased countermeasure effectiveness, particularly for medium to high altitude operations. Improved defensive system performance levels is vital to improving B-1 reliability and maintainability, while ECM capability improvements will enhance aircraft survivability. Planned ECM activities include risk reduction studies and evaluation of candidate systems, and development of a Request For Proposal (RFP) to support a future Engineering Manufacturing and Development (EMD) program. Project 2731 conducted B-1 program studies, including Threat Assessment Group (TAG) analyses of the impact of threat changes on expected B-1 missions and associated threats. These efforts have been incorporated into Project 1019. Together projects 1019 and 4143 will allow theater commanders to take advantage of the B-1's long range and penetration capability to add mass and global reach to conventional operations worldwide.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN BOTH FY 1994

Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F

Project Number: 1019

PE Titles: B-1

Budget Activity: #1 - Strategic Programs

Project Title: B-1 Electronic Countermeasures (ECM) Improvements

PHOTOGRAPH NOT AVAILABLE

POPULAR NAME: B-1 ECM Improvements

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY92	FY93	FY94	To Complete
Program Milestones				II/III
Engineering Milestones				
Test & Evaluation Milestones				
Contract Milestones		Risk reduction planning begins 3rd Quarter	3rd Quarter	
BUDGET (\$000)				Program Total (To Complete)
Major Contract	0	36,400	3,500	146,500
Support Contract	0	4,700	2,500	12,600
In-House Support	0	2,500	0	40,000
Government Furnished Equipment/ Other	0	1,700	1,200	43,100
Total	0	45,300	7,200	242,200

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Program Element: # 0604226F

PE Titles: B-1

Project Number: 1019

Budget Activity: #1 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: B-1 ECM requirements are based on its conventional missions. Project 1019 provides for ECM improvements needed to support the B-1's role identified in the Air Force Bomber Roadmap. Planned activities, to begin in FY93, include ECM risk reduction planning, actual studies and evaluation of alternative systems to counter expected threats, follow on Engineering, Manufacturing, and Development (EMD) planning, and down selection to an EMD alternative in FY94. The EMD Program will begin in FY95. This new project provides for improved situational awareness, countermeasures, and reliability and maintainability. Studies and system evaluations during risk reduction will help determine the most cost effective approach to meeting B-1 ECM requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed System Threat Assessment Report (STAR), Defense Intelligence Agency (DIA) validated Aug 92
- (U) Released draft Air Combat Command (ACC) Mission Need Statement (MNS) for conventional operations - Plan Joint Requirements Oversight Council (JROC) validation in May 93
- (U) Completed Requirements Correlation Matrix - 28 Sep 92

2. (U) FY 1993 Planned Program:

- (U) Complete Integrated Acquisition Strategy - 18 Nov 92
- (U) ACC begins Cost Operational Effectiveness Analysis (COEA)
- (U) Release Request For Proposal (RFP) and award contract for integrating contractor for total system integration responsibilities
- (U) Validate ACC B-1 MNS and Operational Requirements Document (ORD)
- (U) Begin risk reduction planning activities and initiate evaluations of ECM alternatives
- (U) Strategic Systems Committee (SSC) Review in Fall

3. (U) FY 1994 Planned Program:

- (U) Complete evaluation of alternatives, down select to one system to enter EMD
- (U) Develop EMD contractual requirements
- (U) Perform Human Factors Engineering Studies
- (U) Complete integrated EMD plan and System Specification
- (U) Complete Test and Evaluation Master Plan (TEMP) and begin Test Planning writing group meetings
- (U) Select EMD source

4. (U) Program to Completion:

- (U) Present a COEA for DAB Milestone II review
- (U) Begin EMD program; start software/hardware development, design reviews, and lab testing; and conduct system design reviews
- (U) Develop and test required training system and support equipment modifications resulting from software and hardware changes in required systems/subsystems.
- (U) Conduct ground, anechoic chamber, and flight testing
- (U) Perform software/hardware integration and finalize design
- (U) DAB -- Milestone III

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Program Element: # 0604226F

PE Titles: B-1

Project Number: 1019

Budget Activity: #1 - Strategic Programs

D. (U) WORK PERFORMED BY: Contractors have not been determined. Government organizations responsible for various development efforts include: the B-1 System Program Office (SPO) at ASC, Wright-Patterson AFB, OH; Oklahoma City Air Logistics Center (OC-ALC), Tinker AFB, OK; Rome Laboratories, Griffiss AFB, NY; Air Force Electronic Warfare Evaluation Simulator, Dallas, TX; Warner Robins Air Logistics Center (WR-ALC), Robins AFB, GA; the Air Force Operational Test and Evaluation Center (AFOTEC), Kirtland AFB, NM; Air Force Flight Test Center, Edwards AFB, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The previous Air Force B-1 ECM strategy, based principally on Strategic Air Command (SAC) nuclear tasking, does not meet ACC requirements for B-1 ECM in its conventional roles. Accordingly, prior Air Force plans, including acquiring an independent Radar Warning Receiver (RWR) for situational awareness, and procuring the "core" ALQ-161A, have been deleted. The current efforts incorporate ECM studies included under Project 4143. Project 1019, ECM Improvements, encompasses all ECM efforts, including Threat Assessment Group (TAG) studies. Under this ECM project, the Air Force will evaluate options to meet ACC's requirements and select one approach for EMD beginning in FY95.
2. (U) SCHEDULE CHANGES: For budgeting purposes, full up EMD is planned to start in FY95, flight testing in FY97, procurement in FY98, and installation of hardware from FY00 through FY03.
3. (U) COST CHANGES: Current preliminary estimate of funding requirements is \$295M for RDT&E.

F. (U) PROGRAM DOCUMENTATION:

Previous Documents:

- (U) SAC Statement of Need (SON) 3-66, 10 Nov 78
- (U) SAC System Operational Requirements Document (SORD) 003-66 I/II/III/IV-(A), 1 Oct 89, with amendments
- (U) SAC MNS, 8 Jun 81
- (U) DEPSECDEF B-1 Program (Baseline MNS Dec 88)
- (U) B-1 TEMP, Draft
- (U) B-1 Program Management Directive (PMD), 5 Dec 91, amended 15 Mar 92, estimated update May 93
- (U) SAC MNS 6-91, B-1 End-to-End Tester, as amended 20 Feb 92

Conventional Upgrade:

- (U) ACC Concept of Operations (CONOPS) for B-1, 1 Dec 92
- (U) ACC MNS for B-1, 21 Aug 92
- (U) ACC ORD for B-1, 23 Jan 93
- (U) B-1 STAR, DIA validated Aug 92

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Program Element: # 0604226F

PE Titles: B-1

Project Number: 1019

Budget Activity: #1 - Strategic Programs

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0101126F, B-1 Squadrons
- (U) Program Element #0305164F, Navstar Global Positioning System (GPS)
- (U) Program Element #0604618F/N, Joint Direct Attack Munition (JDAM)
- (U) Program Element #0604727F/N, Joint Stand-Off Weapon (JSOW)
- (U) Program Element #0207160F, Tri-Service Stand-Off Attack Missile (TSSAM)
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Aircraft Procurement (BA 01/05):

	<u>FY92</u> <u>Actual</u>	<u>FY93</u> <u>Estimate</u>	<u>FY94</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
10B01B					
-Support Equipment	62,600	88,600	46,500	45,700	243,400
-Interim Contractor Support (ICS)	0	77,200	116,000	337,200	530,400
11B01B MODS					
-ECM Improvements	0	0	0	697,100	697,100
-Conventional Wpns	0	0	1,700	240,100	241,800
-GPS	0	0	0	88,600	88,600
-Anti-Jam Radio	0	0	0	48,000	48,000
-Computer Upgrade	0	0	0	155,700	155,700
-Other Mods		45,300	49,100	105,100	199,500

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

Not Applicable.

J. (U) TEST AND EVALUATION DATA:

Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F

Project Number: 4143

PE Title: B-1

Budget Activity: #1 - Strategic Programs

Project Title: B-1 Conventional Weapons Upgrade

PHOTOGRAPH NOT AVAILABLE

POPULAR NAME: B-1 Conventional Weapons Upgrade

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY92	FY93	FY94	To Complete
Program Milestones			Milestone II/1 Qtr	III
Engineering Milestones				
Test & Evaluation Milestones				
Contract Milestones		3 Qtr/IIA	3 Qtr/IIB	
BUDGET				Program Total
(\$000)	FY92	FY93	FY94	(To Complete)
Major Contract	0	29,100	70,200	653,400
Support Contract	0	0	0	0
In-House Support	0	2,200	5,600	51,700
Government Furnished Equipment/Other	0	4,000	10,500	161,800
Total	0	35,300	86,300	866,900

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Program Element: # 0604226F

PE Title: B-1

Project Number: 4143

Budget Activity: #1 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The B-1 will be the workhorse of the conventional bomber fleet. Current B-1 conventional combat capability consists of the delivery of 84 non-precision 500-pound gravity bombs. The Conventional Mission Upgrade Program (CMUP) will significantly increase B-1 capability, both by upgrading conventional weapons employment capability and by enhancing aircraft survivability [under project 1019, Electronic Countermeasures (ECM) improvements]. Project 4143 provides RDT&E funding for upgrading the avionics computer complex for weapons stores management, fault isolation/detection, and improved maintainability, incorporating Global Positioning System (GPS) navigation system capability, installing a secure voice radio, integrating cluster bomb units (CBUs) and performing weapons bay modifications necessary to employ the Joint Direct Attack Munition (JDAM) and other advanced conventional weapons. This project will provide the B-1 with additional weapons carriage and release growth capability, including MIL-STD-1760, for use with precision and advanced weapons such as JDAM 1/3, Joint Stand-Off Weapon (JSOW) and Tri-Service Attack Missile (TSSAM). The Air Force will select an integrating contractor to manage B-1 upgrade efforts under both project 4143 and project 1019.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed System Threat Assessment Report (STAR), Defense Intelligence Agency (DIA) validated Aug 92
- (U) Released draft Air Combat Command (ACC) Mission Need Statement (MNS) for conventional operations. Planned Joint Requirements Oversight Counsel (JROC) validation in May 93
- (U) Completed Requirements Correlation Matrix 28 Sep 92

2. (U) FY 1993 Planned Program:

- (U) Complete Integrated Acquisition Strategy - 18 Nov 92
- (U) ACC begins Cost Operational Effectiveness Analysis (COEA)
- (U) Conduct special acquisition program review and obtain approval
- (U) Release Request For Proposal (RFP) and award contract for integrating contractor for total system integration responsibilities
- (U) Validate ACC MNS and Operational Requirements Document (ORD)
- (U) Initiate, with integrating contractor, twelve month design analysis, Engineering Manufacturing and Development (EMD) planning and preliminary design for JDAM 1, MIL-STD-1760, GPS, radio integration, and computer upgrades
- (U) Complete System Maturity Matrices
- (U) Conduct trade studies on computer upgrade, launcher/bomb module
- (U) Complete Test and Evaluation Master Plan (TEMP)
- (U) Start software coding for CBU upgrade of modifiable ballistics
- (U) Strategic Systems Committee (SSC) Review in Fall

3. (U) FY 1994 Planned Program:

- (U) Begin test activities, based on FY93 development studies and contract awards
- (U) Begin software and hardware development for computer upgrades, GPS, and MIL-STD-1760
- (U) Start JDAM 1 EMD activities such as wind tunnel testing and aircraft integration
- (U) Start JDAM 3 demonstration effort to support EMD activity in FY97 - FY99
- (U) Conduct both ground and flight tests of anti-jam secure radio
- (U) Complete integrated EMD plan and finalize System Specification

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Program Element: # 0604226F

PE Title: B-1

Project Number: 4143

Budget Activity: #1 - Strategic Programs

4. (U) Program to Completion:

- (U) Present a COEA for JDAM 3/Mk-62&65/JSOW/TSSAM weapons integration for Defense Acquisition Board (DAB) Milestone II review
- (U) Continue upgrade activities begun in FY93/94
- (U) Continue software and hardware development for GPS and MIL-STD-1760 integration, and avionics computer upgrade
- (U) Continue JDAM 1 EMD and JDAM 3 demonstration effort to support EMD activity in FY97 - FY99
- (U) Conduct flight testing of CBUs modifiable ballistic software
- (U) Complete avionics computer development and GPS integration and laboratory tests, system design reviews and flight testing
- (U) Develop and test launcher modifications for conventional weapons capability
- (U) Conduct developmental and initial operational flight tests of GPS/1760/JDAM 1 modifications
- (U) Conduct sufficient separation tests to certify JDAM 1, JDAM 3, JSOW, and TSSAM on the B-1
- (U) Perform weapons integration with GPS and computer upgrades
- (U) Develop support equipment and training system modifications resulting from GPS, avionics computer and weapons integration changes
- (U) Conduct JDAM 3, JSOW, and TSSAM development and test activities
- (U) Develop, integrate, and test additional support equipment changes as required

D. (U) Work Performed By: Contractors have not yet been determined. Government organizations responsible for development efforts include: the B-1 System Program Office (SPO) at ASC, Wright-Patterson AFB, OH; Oklahoma City Air Logistics Center (OC-ALC), Tinker AFB, OK; Rome Laboratories, Griffiss AFB, NY; Air Force Electronic Warfare Evaluation Simulator, Dallas, TX; Warner Robins Air Logistics Center (WR-ALC), Robins AFB, GA; the Air Force Operational Test and Evaluation Center (AFOTEC), Kirtland AFB, NM; Air Force Flight Test Center, Edwards AFB, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The Air Force's Bomber Roadmap significantly changed the scope and pace of weapons programs reported in 93. Last submission JDAM 1 and associated upgrades concerning the computer, anti jam radio and GPS were included in the program. Additional weapons to be integrated on the B-1 include JSOW and JDAM 3. Defensive avionics system upgrade activity is now conducted under Project 1019, ECM Improvements.
2. (U) SCHEDULE CHANGES: New schedule integrates weapons in accordance with the Bomber Roadmap.
3. (U) COST CHANGES: Funding associated with defensive avionics system upgrade activity is now in Project 1019, ECM Improvements. Current preliminary estimate of funding requirements for Bomber Roadmap conventional capabilities improvements is \$989M for RDT&E.

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Program Element: # 0604226F
PE Title: B-1

Project Number: 4143
Budget Activity: #1 - Strategic Programs

F. (U) PROGRAM DOCUMENTATION:

Previous Documents:

- (U) Strategic Air Command (SAC) Statement of Need (SON) 3-66, 10 Nov 78
- (U) SAC Systems Operational Requirements Document (SORD) 003-66-I/II/III/IV-(A), 1 Oct 89, as amended
- (U) SAC MNS, 8 Jun 81
- (U) DEPSECDEF B-1 Program (Baseline MNS Dec 88)
- (U) B-1 TEMP, draft
- (U) B-1 Program Management Directive (PMD), (5 Dec 91), as amended

Conventional Upgrade:

- (U) Air Combat Command (ACC) Concept of Operations (CONOPS) for B-1, 1 Dec 92
- (U) ACC MNS for B-1, 21 Aug 92
- (U) ACC ORD for B-1, 23 Jan 93
- (U) B-1 STAR, DIA validated Aug 92

G. (U) RELATED ACTIVITIES

- (U) Program Element #0101126F, B-1 Squadrons
- (U) Program Element #0305164F, GPS
- (U) Program Element #0604618F/N, JDAM
- (U) Program Element #0604727F/N, JSOW
- (U) Program Element #0207160F, TSSAM
- (U) Program Element #0208006F, Air Force Mission Planning Systems
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Aircraft Procurement (BA 01/05):

	FY92 Actual	FY93 Estimate	FY94 Estimate	To Complete	Total Program
10B01B					
-Support Equipment	62,600	88,600	46,500	45,700	243,400
-Interim Contractor Support (ICS)	0	77,200	116,000	337,200	530,400
11B01B MODS					
-ECM Improvements	0	0	0	697,100	697,100
-Conventional Wpns	0	0	1,700	240,100	241,800
-GPS	0	0	0	88,600	88,600
-Anti Jam Radio	0	0	0	48,000	48,000
-Computer Upgrade	0	0	0	155,700	155,700
-Other Mods		45,300	49,100	105,100	199,500

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Program Element: # 0604226F

PE Title: B-1

Project Number: 4143

Budget Activity: #1 - Strategic Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

Not Applicable.

J. (U) TEST AND EVALUATION DATA:

Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604227F
 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

A. (U) RESOURCES: (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2325 Simulator Development Activities	3,500	3,393	3,747	Cont	TBD
2769 Simulator Update Development/Simulator Requirements Definition	3,399	8,119	2,515	Cont	TBD
2851 Standard DOD Simulator Data Base/Common Transformation Program	3,500	3,393	2,515	Cont	TBD
2901 B-1B Weapon Systems Trainer	5,354	3,489	0	0	131,839
2968 Modular Simulator Design	2,400	572	0	0	10,696
3000 KC-135 Aircrew Training System	0	0	1,918	2,995	5,998
3135 Advanced Training System (ATS)	6,958	3,878	1,909	Cont	TBD
3282 C-17 Aircrew Training System	3,000	1,039	677	0	75,398
3772 C-141 Aircrew Training System	3,911	760	581	0	28,426
3775 Manpower, Personnel, and Training	700	472	0	0	TBD
4022 Simulator for Electronic Combat Training (SECT)	7,083	10,003	8,471	2,298	27,807
4033 Joint Primary Aircraft Training System (JPATS)	1,337	0	86*	0*	0*
4156 AFSPACECOM Training Development	0	0	235	Cont	TBD
4157 USAFA Computer Education/Training Development	0	0	235	Cont	TBD
TOTAL	41,142	35,118	22,879	Cont	TBD

* JPATS Ground Based Training System (GBTS) funds for FY94-99 were transferred to PE64233F, Specialized Undergraduate Pilot Training (SUPT).

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is a continuing program element for development of aircrew and maintenance training techniques and devices. Objectives are to adapt simulation technology and standards developed in the laboratories and industry to satisfy MAJCOM training requirements, and to develop prototype training devices. New program starts include the AFSPACECOM and USAFA Training Development programs in FY94. Initial funding for the KC-135 Aircrew Training System upgrades began in FY92 within project 2769, and will transition to its own project in FY94. Development funds for the Joint Primary Aircraft Training System (JPATS) Ground Based Training System (GBTS) were transferred to the host aircraft PE (64233F) in conjunction with the evolving Integrated Weapon System Management (IWSM) process.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2325 - Simulator Development Activities: Provides the funds to conduct engineering development of new aircrew/maintenance training technologies and standards. Funds the pre-production of first article training devices to satisfy the customer's training requirements. Efforts currently planned or underway include an operational evaluation of four visual simulation display technologies designed to determine which low-altitude tasks can be taught with each technology. Another effort is the Simulator Data Integrity Program (SDIP), which developed a military process standard for the Aircrew Training Equipment source data flow from the weapon system contractor to the training system contractor. Project 2325 is a continuing project that transitions laboratory developments into technology insertion projects.

(U) FY 1992 Accomplishments:

- (U) Developed handbook to aid in the implementation of the developed SDIP standard.
- (U) Completed Simulator Delay Study which determined the training impact of late responses to pilot inputs in simulators.
- (U) Published Structural Modeling handbook which aids the implementation of the Ada software language in simulator development.
- (U) Began Training Management System (TMS) program to develop a TMS utilizing artificial intelligence to allow greater flexibility of use.

(U) FY 1993 Planned Program:

- (U) Evaluate visual system display technologies and publish the results.
- (U) Develop tool to measure simulator signal delays over long haul networks and determine the training impact of these delays.
- (U) Develop implementation plan for the SDIP program.
- (U) Begin design of a Universal Threat Simulator System (UTSS).

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U) FY 1994 Planned Program:

- (U) Continue development of a UTSS.
- (U) Develop objective measures for the transfer of training from the simulator to the aircraft.
- (U) Determine the application of CD-ROM technology in training systems.
- (U) Study the training impacts of modifying instrumentation layout and hardware on the T-38 aircraft.

(U) Work Performed By: The Training Systems SPO, ASC, Wright-Patterson AFB, OH. Contractors include JWK International Annandale, VA; SIMTEC, Manassas, VA; ECC Corporation, Wayne, PA; Southwest Research Institute (SwRI), San Antonio, TX; and the Software Engineering Institute (SEI), Pittsburgh, PA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2769 - Simulator Update Development/Simulator Requirements

Definition: Develops updates to training systems to maintain and improve their supportability and effectiveness. Initiatives are identified and funded through this project to modify and upgrade existing training systems. Project 2769 funds initial and continuing development activities on the KC-135 Aircrew Training System (ATS), C-130 maintenance training devices, Undergraduate Air Weapons Controller Training (UCT), AFSPACECOM, and USAFA programs. All but the UCT and C-130 simulator update efforts will be broken out into their own projects starting in FY94. Project 2769 is also used to: a) Define requirements for new training systems in the form of tasks to be trained (this supports a Milestone 0 decision); b) Develop options to meet the requirements (this supports a Milestone 1 decision); c) Build a prototype of one or more of the options to evaluate the training effectiveness of those options.

(U) FY 1992 Accomplishments:

- (U) Began development of USAFA prototype module for Air Power Series.
- (U) Began AFSPACECOM Training System Requirements Analysis (TSRA) for Launch Base Operations.
- (U) Completed UCT source selection.

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U) FY 1993 Planned Program:

- (U) Continue KC-135 ATS development activities (see Project 3000 for description)
- (U) Begin R&D activities associated with Interactive Multi Media modules on the History of Air Power (USAFA).
- (U) Continue analysis of AFSPACECOM training requirements.
- (U) Complete UCT contract award and prototype development.

(U) FY 1994 Planned Program:

- (U) Application of Aircrew Training concepts to Air Combat Command (ACC) aircraft.
- (U) Begin implementing DoD Instruction 1322.20 across the Training Systems division.
- (U) Begin update development activities on C-130 maintenance training devices.

(U) Work Performed By: The Training Systems SPO, ASC/YT, Wright-Patterson AFB, OH; The Theater Command and Control SPO, ESC/SZ, Hanscom AFB, MA; USAFA, Colorado Springs, CO; and HQ AFSPACECOM, Peterson AFB, CO. Prime contractors are CAE-Link, Dallas, Texas; JWK Annandale, VA; ECC Corporation Wayne, PA; and SwRI, San Antonio, TX.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 2851 - Standard DOD Simulator Data Base/Common Transformation Program: Develops a standard DOD digital data base library and distribution function exchange standards and a data base enhancement and generation capability. This minimizes simulator database development redundancy within and among the services, and will maximize database utility and interoperability.

(U) FY 1992 Accomplishments:

- (U) Implemented SIF capability to demonstrate data base interoperability between Aircrew Training Systems.
- (U) Began Engineering Manufacturing Development (EMD) effort for prototype database standardization system.

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PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U) FY 1993 Planned Program:

- (U) Conclude the EMD and pre-production support efforts.
- (U) Begin upgrade of system software and hardware suite in preparation for operational status.
- (U) Demonstrate SIF standard distributed interactive simulation at the Interservice/Industry Training Simulation Conference (I/ITSC).

(U) FY 1994 Planned Program:

- (U) Complete upgrade of system software and hardware suite.
- (U) Complete system installation, test, and training.
- (U) Begin initial system operation.

(U) Work Performed By: The Training Systems SPO, ASC, Wright-Patterson AFB OH. Contractor is Planning Research Corporation, McLean, VA.

(U) Related Activities:

- (U) Project 2851 is a joint service project conducted under the Joint Logistic Commanders (JLC) through the Joint Technical Coordinating Group for Training Systems and Devices.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 2901 - B-1B Weapon System Trainer: Develops aircrew training devices for all B-1B crew members to include mission rehearsal, takeoff and landing, navigation, air refueling, threat analysis/countermeasures, low-level penetration, weapons delivery, and emergency procedures.

(U) FY 1992 Accomplishments:

- (U) Delivered Overwing Fairing Modification on all trainers.
- (U) Delivered Weapon System Trainer (WST) Version 2.1.
- (U) Delivered WST Version 2.7.
- (U) Delivered Maintenance Trainer (MT) Version 2.7.

(U) FY 1993 Planned Program:

- (U) Deliver WST Version 2.9.
- (U) Deliver WST Version 4.0.
- (U) Deliver MT Version 2.9.
- (U) Deliver MT Version 4.0.
- (U) Complete system development.

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PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: The Training Systems SPO, ASC, Wright-Patterson AFB, OH. Prime contractor; Boeing Military Co., Huntsville, AL.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

(U) Aircraft Procurement/Budget Activity, C1, P-1 Line Item 1

FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
2,600	857	0	0	177,870

(U) International Cooperative Agreements: Not applicable.

5. (U) Project 2968 - Modular Simulator Design: Develop a MIL-STD for flight simulator software modules to allow reuse of software from one simulator to the next and simplify the job of updating module software to maintain simulator concurrency with aircraft.

(U) FY 1992 Accomplishments:

- (U) Completed concept demonstration and validation.
- (U) Analyzed interoperability with simulator networks.
- (U) Analyzed advanced avionics compatibility for modular simulation.

(U) FY 1993 Planned Program:

- (U) Publish system specifications for future acquisitions.
- (U) Update technical documentation to include newly developed modules.
- (U) Complete program.

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: The Training Systems SPO, ASC Wright-Patterson AFB, OH. Prime contractor; Boeing Military Airplane Co., Huntsville, AL.

(U) Related Activities:

- (U) Project 2968 is a joint service project conducted under the Joint Logistic Commanders (JLC) through the Joint Technical Coordinating Group for Training Systems and Devices.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U)Other Appropriation Funds: Not applicable.

(U)International Cooperative Agreements: Not applicable.

6. (U)Project 3000 - KC-135 Aircrew Training System: Develops aircrew training devices and courseware for the KC-135E and KC-135R aircrew members including Air National Guard and Air Force Reserve components to satisfy continuation training requirements and allowing replacement of current "blue-suit" instructors with contractor instructors. This program will be funded via Project 2769 through FY93.

(U)FY 1992 Accomplishments:

- (U) Awarded KC-135 ATS contract.
- (U) Began work on ANG/AFRES Computer Based Training (CBT).
- (U) Began work on trade studies.

(U)FY 1993 Planned Program:

- (U) Complete design and prototype of CBT for ANG/AFRES training.
- (U) Begin production of CBT courseware.
- (U) Complete training enhancement trade studies.
- (U) Develop new courses to accomplish new training requirements.

(U)FY 1994 Planned Program:

- (U) Complete CBT production and deployment.
- (U) Develop replacement for KC-135 WST navigation station due to KC-135 WST elimination.
- (U) Develop replacement for obsolete KC-135 Boom Operator Part Task Trainer (BOPTT).

(U)Work Performed By: The Training Systems SPO, ASC, Wright Patterson AFB, OH. Prime contractor is Flight Safety International Corporation, Littleton, CO.

(U)Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U)Other Appropriation Funds: Not Applicable.

(U)International Cooperative Agreements: Not Applicable.

7. (U)Project 3135 - Advanced Training System (ATS): ATS supports instructional development, delivery, evaluation, and resource management at Air Training Command's Technical Training Centers. Its main goals are to free instructors for

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

individualized instruction in complex, highly technical tasks; promote efficient training; and provide rapid course creation and updating. Commercial hardware and software will yield a reliable and easily maintainable system.

(U) FY 1992 Accomplishments:

- (U) Completed final Software Preliminary Design Review; two of three Critical Design Reviews.
- (U) Installed Development Test and Evaluation suite.
- (U) Delivered Operational Test and Evaluation equipment.

(U) FY 1993 Planned Program:

- (U) Final Software Critical Design Review.
- (U) Complete Development Test and Evaluation.
- (U) Begin AFOTEC-conducted Operational Test and Evaluation.
- (U) Activate Low Rate Initial Production option.
- (U) Begin Production Request for Proposal.

(U) FY 1994 Planned Program:

- (U) Complete installation at Keesler AFB.
- (U) Award production contract.
- (U) Begin course conversions.

(U) Work Performed By: Advanced Training System Branch, Human Systems Program Office, HSC, Brooks AFB, TX. Contractor is IBM Federal Systems Company, Manassas, VA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

8. (U) Project 3282 - C-17 Aircrew Training System (ATS): Provides initial and continuation training for C-17 aircrew members. Training will be totally contractor administered and supported, with Air Mobility Command (AMC) evaluating the final product - a fully qualified aircrew member. The training system will be developed concurrently with the aircraft development and production efforts.

(U) FY 1992 Accomplishments:

- (U) Completed basic courseware development.
- (U) Began training initial squadron crews at Charleston AFB.

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

- (U) Began modifying developmental unit to maintain concurrency with aircraft.

(U) FY 1993 Planned Program:

- (U) Develop and incorporate all outstanding (aircraft driven) training change requirements.
- (U) Complete advanced (Airdrop) courseware.
- (U) Begin on-site installation of Loadmaster Cargo Compartment Trainer at Altus AFB.

(U) FY 1994 Planned Program:

- (U) Complete special operations courseware.
- (U) Begin formal school operations.
- (U) Modify Charleston AFB trainers to maintain concurrency with aircraft.

(U) Work Performed By: Training Systems SPO, ASC, Wright-Patterson AFB, OH. Contractor is McDonnell Douglas Training Systems Inc., Bedford, TX.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds:

Aircraft Procurement/ Budget Activity 02, P-1 Line Item 8

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	0	28,200	34,100	93,507	239,707

(U) International Cooperative Agreements: Not applicable.

9. (U) Project 3772 - C-141 Aircrew Training System (ATS): The C-141 ATS program will develop and deploy a training system for C-141 active duty and reserve forces aircrew members, as well as maintenance engine run technicians. It will also include the Basic Flight Engineer Course for all DoD and Allied flight engineers. The program provides maintenance and logistic support of all ATS associated training equipment, a training management system to track student progress and update the training programs, and contractor instructor support of the new C-141 ATS following delivery to the sites.

(U) FY 1992 Accomplishments:

- (U) Delivered first operational Weapon System Trainer (WST) with advanced visual system and 6 degree of freedom (DOF) motion system.

Program Element: #0604227F
 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

- (U) Basic Flight Engineer (BFE) course implemented.

(U) FY 1993 Planned Program:

- (U) Second development WST upgraded at Altus AFB.
- (U) First production WST at McGuire AFB upgraded.
- (U) All Courseware Readiness Reviews (CRRs) complete.

(U) FY 1994 Planned Program:

- (U) System Training Readiness Review (STRR) at Altus AFB.
- (U) Upgrade of McGuire's second WST.
- (U) Deliver upgraded WST to Travis AFB.

(U) Work Performed By: The Training Systems SPO, ASC, Wright-Patterson Air Force Base, OH manages this effort. The prime contractor for this program is Hughes Training Systems, Arlington, TX.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: (\$ in Thousands):

(U) Aircraft Procurement/ Budget Activity 05, P-1 Line Item 37

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	8,800	9,463	16,875	5,691	42,629

(U) International Cooperative Agreements: Not applicable.

10. (U) Project 3775 - Integrated Manpower, Personnel, Training, and Safety

(IMPACTS): Funding is used to pursue initiatives which integrate Manpower, Personnel, Training, and Safety (MPTS) considerations into the weapon systems acquisition process. Personnel trained in these specialties are responsible for the development of critical acquisition data, including the Manpower Estimate Report (MER), a DoD-directed requirement to OSD and Congress.

(U) FY 1992 Accomplishments:

- (U) Completed development System Integration Specialist Course.
- (U) Continued front-end analysis/requirement identification.
- (U) Completed MPT integrated data base.

(U) FY 1993 Planned Program:

- (U) Conduct MPT courses and seminars.
- (U) Continue front-end analysis work.

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Program Element: #0604227F
 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

- (U) Continue work on analysis models and tools.

(U) FY 1994 Planned Program:

- (U) Not Applicable. Funding for future MPT efforts will transfer to a PE controlled by AF/MO starting in FY94.

(U) Work Performed By: Deputy for Acquisition Logistics, Wright-Patterson AFB, OH. Contractors are Hay System Inc., Washington DC, and Automation Research Systems Ltd., Alexandria, VA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

11. (U) Project 4022 - Simulator for Electronic Combat Training (SECT): The SECT will replace outdated simulation devices that support Electronic Warfare Officer Training. The simulator will train student officers in basic threat recognition and associated electronic combat procedures in a simulated airborne environment. This training is possible only with simulation due to environment, security and range restrictions.

(U) FY 1992 Accomplishments:

- (U) Released Request For Proposal (RFP).
- (U) Awarded contract on 29 Apr 92.
- (U) Completed System Requirements Review (SRR).

(U) FY 1993 Planned Program:

- (U) Complete Preliminary Design Review (PDR).
- (U) Complete Critical Design Review (CDR).
- (U) Complete system design and begin hardware/software development.

(U) FY 1994 Planned Program:

- (U) Begin in-plant test of system.
- (U) Deploy and complete on-site test of system at Randolph AFB, TX

(U) Work Performed By: The Training Systems SPO, ASC, Wright-Patterson Air Force Base, OH manages this effort. Prime contractor is AAI Corp., Cockeysville, MD.

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 PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

12. (U) Project 4156 - AFSPACECOM Training Development: This project consists of Training System Requirements Analyses to refine AFSPACECOM requirements for training systems and/or devices. The training systems and devices span all areas of AFSPACECOM missions; launch base operations, satellite command and control, surveillance, and early warning.

(U) FY 1992 Accomplishments (funded via Project 2769 through FY93):

- (U) Awarded contract (27 Apr 92) for Training System Requirements Analysis (TSRA) for Launch Base Operations.
- (U) Completed System Requirements Review (SRR) and Program Management Review (PMR) #1.

(U) FY 1993 Planned Program:

- (U) Complete TSRA for Launch Base Operations.

(U) FY 1994 Planned Program:

- (U) Begin TSRA for Milstar program.
- (U) Begin TSRA for NAVSTAR GPS.

(U) Work Performed By: The Training Systems SPO, ASC, Wright Patterson AFB, OH, manages this effort. FY 92 work was performed by ECC International Corp, Wayne, PA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

13. (U) Project 4157 - USAFA Computer Education/Training Development: This project directs the development efforts for the integration of advanced educational technology to the curriculum of the Air Force Academy. Specific efforts include a Training Requirements Assessment, Educational Innovation Program, Network Classroom Systems, and the development of a proof of concept, Interactive Multi-Media series on the History of Air Power. These

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PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide
Mission Support

efforts provide an organizational framework for USAFA to effectively apply technology-based educational tools.

(U) FY 1992 Accomplishments (funded via Project 2769 through FY93):

- (U) Began development on Advanced Educational Training Systems.
- (U) Began USAFA training systems requirements assessment.
- (U) Determined development cost for USAFA Experimental Course.
- (U) Began development of USAFA prototype module for Air Power Series.

(U) FY 1993 Planned Program:

- (U) Begin development of Innovative Educational project to improve education at USAFA through the use of advanced technologies.
- (U) Begin R&D activities associated with Interactive Multi Media modules on the History of Air Power.

(U) FY 1994 Planned Program:

- (U) Continue educational projects across curriculum on hosted network classrooms.
- (U) Continue development of Air Power series.

(U) Work Performed By: The Training Systems SPO, Wright Patterson AFB, OH, and the USAFA, Colorado Springs, CO, manage this effort. Prime Contractor is Southwest Research Institute (SwRI), San Antonio, TX.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604231E
PE Title: C-17 Program

Budget Activity: #4-Tactical Programs

Project Title: C-17

POPULAR NAME: C-17

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones				IIIB Jul 95
Engineering Milestones				
T&E Milestones			Complete Dedicated IOT&E - 3Q FY 94	Complete DT&E - 2Q FY 95
Contract Milestones		Lot IV 4 A/C Jul 93	Lot V Dec 93	
BUDGET	FY 1992	FY 1993	FY 1994	Program Total
(\$000)				(To Complete)
Major Contract	174,200	94,900	84,900	31,500
Support Contract	2,413	4,693	3,476	17,760
In-House Support	6,887	3,017	14,814	12,790
GFE/Other	72,774	66,090	76,710	66,250
Total	256,274	168,700	179,900	128,300

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Program Element: #0604231F
PE Title: C-17 Program

Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Additional airlift capability is needed for rapid strategic deployment of combat forces to support national objectives and for timely theater movement to meet forward area mobility requirements. Airlift is vital to meet U.S. mobility requirements and allows the flexibility to tailor a response to contingencies anywhere in the world. The congressionally mandated Mobility Requirements Study (MRS), Vol I, forwarded to Congress on 23 Jan 92, once again, validated the need for the C-17 aircraft. Specific tasks associated with the airlift mission area include deployment, employment (airland, airdrop, and extraction), sustaining support, retrograde, and combat redeployment. The C-17 will be capable of performing the entire spectrum of airlift missions and is specifically designed to operate effectively and efficiently in both the strategic and theater environments. Therefore, it's increased overall airlift capability will be able to replace the capabilities lost from retiring aging C-130 and C-141 aircraft beginning in FY 93. The C-17 is the only airlift modernization effort underway and will be capable of performing the airlift mission well into the 21st century.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued developmental testing
- (U) Completed assembly of durability and static aircraft test articles
- (U) Began static testing
- (U) Began maintenance and aircrew training device deliveries to Charleston AFB
- (U) Conducted first flight/delivery of production/test aircraft (P-1, P-2, and P-3)
- (U) Began P-1, P-2, and P-3 aircraft flight testing
- (U) Completed over 570 hours of flight testing (T-1, P-1, P-2, P-3)
- (U) Continued support equipment design and drawing release
- (U) Continued avionics/software integration
- (U) Began aircrew training of initial crews at Charleston AFB
- (U) Completed O-level technical order (T.O.) validation
- (U) Awarded Lot V advance buy contract for 8 aircraft
- (U) Issued Lot V and Lot VI RFP
- (U) Began delivery of support equipment and technical orders to Charleston AFB

2. (U) FY 1993 Planned Program:

- (U) Continue developmental testing
- (U) Begin durability testing to two service lives (60,000 hrs)
- (U) Award the definitized Lot IV production contract for 4 aircraft
- (U) Award advance buy contract for Lot VI
- (U) Continue delivery of support equipment and technical orders to Charleston AFB
- (U) Continue I-level T.O. validation
- (U) Conduct first flight/delivery of production/test aircraft P-4
- (U) Begin live fire test (LFT) program
- (U) Begin P-4 aircraft flight testing
- (U) Conduct aircraft acceptance/delivery functional check flight procedures on P-5
- (U) Complete P-5 FCA/PCA at MDA and EMR/Lightning tests at Patuxent NAS
- (U) Deliver 1st operational aircraft (P-6) to Charleston AFB
- (U) Begin initial operations at Charleston AFB
- (U) Conduct Lots V and VI should-cost

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Program Element: #0604231E
PE Title: C-17 Program

Budget Activity: #4-Tactical Programs

3. (U) FY 1994 Planned Program:

- (U) Complete dedicated IOT&E
- (U) Complete All Weather Testing
- (U) Complete one life (30,000 hrs) of durability testing
- (U) Complete static article ultimate strength testing
- (U) Begin maintenance and aircrew training device deliveries to Altus AFB
- (U) Begin Airlift Defensive Systems (ADS) integration
- (U) Award the definitized Lot V and VI production contracts
- (U) Continue verifying base-level technical orders
- (U) Continue LFT

4. (U) Program to Completion:

- (U) Initial Operational Capability (IOC) at Charleston AFB (P-16 delivery, 12th aircraft)
- (U) Begin initial operations at Altus AFB
- (U) Continue and complete 2nd life of durability testing
- (U) Continue and complete LFT
- (U) Complete DT&E
- (U) Complete Milestone IIIB
- (U) Complete Support Equipment (SE) FCA/PCA
- (U) Complete ADS integration
- (U) Complete verification of base-level technical orders
- (U) Complete RM&A evaluation

D. (U) WORK PERFORMED BY:

McDonnell Douglas Aerospace, Long Beach, California.
Wright Lab, Wright-Patterson AFB, Ohio

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The current estimate for the aircraft payload/range and the landing and takeoff distances have been adjusted to account for the current projected operating weight. The maximum payload/range System Operational Requirements Document (SORD) threshold is 160,000lbs/2400nm.
2. (U) SCHEDULE CHANGES: Test delays due to late delivery, lower test efficiency, and lower flying hour rate. The Lot IV contract award slipped due to requirement for a reproposal due to Congressional reduction and direction from OSD to award the lot as a separate contract. Lot V contract award slipped in order to combine the award with the Lot VI contract award. Further reductions to the program will likely move aircraft deliveries and contract awards farther to the right. Milestone IIIB is currently scheduled for Jul 95.
3. (U) COST CHANGES: RDT&E: Reductions in FY92 (\$111M) and FY93 (\$29M) were due to separation of ceilings on the 2108 contract between full scale development and Lots I and II, with a corresponding increase to FY87/88/89 production funding. PBD reductions in FY93 were primarily for inflation, travel, inventory, and a 3% general reduction. Increases in FY94 are primarily for live fire testing, additional flight testing, transfer of Airlift Defensive Systems (ADS) funding from another program element, SATCOM, and Auto G-File development efforts. PROCUREMENT: Congressional reductions in FY93 of 2 aircraft, an initial spares reduction of \$149.5M, and PBD reductions due to military personnel sourcing

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Program Element: #0604231F
PE Title: C-17 Program

Budget Activity: #4-Tactical Programs

and a general reduction. Congress also changed advance procurement for FY94 to \$250.9M (provides coverage for only 8 aircraft vs. 12 in the budget request). The Air Force subsequently amended the FY94 budget request from 8 to 6 aircraft in response to desired defense spending cuts.

F. (U) PROGRAM DOCUMENTATION:

- (U) SON (MENS), Nov 80
- (U) DCP, Jun 88
- (U) ADM, 6 Nov 89
- (U) SORD, 23 May 91
- (U) TEMP, Approved 4 Oct 88; Change 5, 31 Jul 91.
- (U) Acquisition Program Baseline (APB), 20 Feb 92.
- (U) ADM, 2 Apr 92
- (U) PMD, 6 Apr 92

G. (U) RELATED ACTIVITIES: None. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Based on FY94 PB

- (U) Procurement (PE #0401130F):

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
Cost	1,812,463	2,041,249	2,378,200	23,655,600	33,516,112
Quantity	4	6	6	94	120

- (U) Military Construction (PE #0401130F):

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
Cost	76,100	31,100	15,200	164,800	327,300

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

<u>Event</u>	<u>T&E ACTIVITY (PAST 36 MONTHS)</u>	
	<u>Date</u>	<u>Results</u>
-Landing Gear Drop Tests	Jul 90-Feb 91	Satisfactory
-Propulsion System		
Qualification Tests	Aug 90-May 91	Satisfactory
-T-1 Avionics System		
Level Tests	Sep 90-Sep 91	Satisfactory
-Fuel System Simulator	Dec 90-Apr 91	Completed
Qualification Tests (Phase A)		
-P-1 Airload Calibration Test	Jun 91-Aug 91	Satisfactory
-T-1 1st Flight/Flight Test Start	15 Sep 91	Satisfactory/On-going

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Program Element: #0604231E
PE Title: C-17 Program

Budget Activity: #4-Tactical Programs

T&E ACTIVITY (PAST 36 MONTHS) continued

-Initiate DT&E	15 Sep 91	Satisfactory/On-going
-Static Aircraft Testing Start	Oct 91	On-going
-P-1 Enters Flight Test/1st Flight	18 May 92	Satisfactory/Ongoing
-P-2 Enters Flight Test/1st Flight	21 Jun 92	Satisfactory/Ongoing
-P-3 Enters Flight Test/1st Flight	7 Sep 92	Satisfactory/Ongoing
-P-4 Enters Flight Test/1st Flight	9 Dec 92	Satisfactory/Ongoing
-P-5 1st Flight/Acceptance Testing	31 Jan 93	Satisfactory
-P-5 Delivery to AF/EMR/Lightning Testing	12 Mar 93	Satisfactory/Ongoing

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
-Fuel System Simulator	Jul 93	
Qualification Tests (Phases B&C)		
-Initiate Dedicated IOT&E	Feb 94	
-Static article tests completed	1Q FY 94	
-Complete Dedicated IOT&E	3Q FY 94	
-Complete DT&E	2Q FY 95	
-Durability article tests completed	4Q FY 95	

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604233F
 PE Title: Specialized Undergraduate
 Pilot Training (SUPT)

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
643853 T-1A Tanker-Transport Training System (TTTS)	3,133	2,337	2,205	2180	16,991
644228 T-3A Enhanced Flight Screener (EFS)			191	188	379
644102 Joint Primary Aircraft Training System (JPATS)*	<u>1,063</u>	<u>2,055</u>	<u>41,575</u>	<u>181,338</u>	<u>226,031</u>
Total	4196	4,392	43,971	183,706	243,401

*JPATS Ground Based Training System (GBTS) funds for FY94-99 are transferred from PE 0604227F to PE 0604233F

- B. (U) BRIEF DESCRIPTION OF ELEMENT: The T-1A (Tanker-Transport) Training System is required to implement Specialized Undergraduate Pilot Training (SUPT) in Air Education and Training Command. The T-1A is a derivative of the commercially available Beech 400A "Beechjet" missionized for the training role. The aircraft will accommodate an instructor and two students. The Ground Based Training System (GBTS) portion of the T-1A Training System will include compatible simulators, mock-ups, courseware, syllabus, and student management and scheduling. The Tanker-Transport syllabus will include training in high and low altitude instrument approaches, crew coordination, asymmetric thrust situations, airdrop fundamentals, low-level navigation, airborne rendezvous, and cell formation. JPATS, an approved new start, is planned as a joint USAF/USN venture to replace the Services' fleets of primary trainer aircraft (T-37/T-34 respectively) and associated GBTS. The USAF will serve as the lead or Executive Service. The T-3A Enhanced Flight Screener will be used at the United States Air Force Academy and Hondo Field, Texas to standardize flight screening prior to SUPT. The aircraft will be aerobatic certified and have side-by-side seating, dual stick controls, dual throttles, and tricycle gear.

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Program Element: #0604233F
 PE Title: Specialized Undergraduate
 Pilot Training (SUPT)

Budget Activity: #4 - Tactical Programs

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) 643853, T-1A (Tanker-Transport) Training System:
 See PE description above.

(U) FY 1992 Accomplishments:

- (U) Delivered first aircraft
- (U) Provided mission support for T-1A operation of SPO
- (U) Started Instructor Pilot (IP) training

(U) FY 1993 Planned Program:

- (U) Start student training at Reese AFB, TX
- (U) Deliver courseware for Pilot Instructor Training (PIT) at Randolph AFB, TX
- (U) Activate Randolph AFB PIT and Training System Support Center (TSSC)
- (U) Hazardous Material Identification and modification
- (U) Begin production of Vance AFB, OK aircraft and simulators
- (U) Provide mission support

(U) FY 1994 Planned Program:

- (U) Start student training at Laughlin AFB, TX
- (U) Complete Operational Readiness Verification
- (U) Complete Randolph AFB, TX deliveries
- (U) Provide mission support

- (U) Work Performed By: Prime Contractor is McDonnell-Douglas Training Systems (MDTS). Aircraft sub is Beech Aircraft; simulator sub is Quintron. Courseware developed by MDTS.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in thousands):

- (U) Aircraft and GBTS procurement (BA 03):
 (does not include initial spares)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	156,142	157,031	147,356	174,658	947,045
(QTY)	(34)	(36)	(35)	(32)	(180)

- (U) International Cooperative Agreements: Not applicable.

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Program Element: #0604233E
 PE Title: Specialized Undergraduate
 Pilot Training (SUPT)

Budget Activity: #4 - Tactical Programs

2. (U) 644228, T-3A Enhanced Flight Screener:
 See PE description above.

(U) FY 1992 Accomplishments:

- (U) Provided mission support for EFS operation of SPO

(U) FY 1993 Planned Program:

- (U) Provide mission support

(U) FY 1994 Planned Program:

- (U) Provide mission support

(U) Work Performed By: Prime contractor is Slingsby Aviation Limited. Aircraft production and contract logistics support is being performed by Northrop Worldwide Aircraft Services Inc.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in thousands):

- (U) Aircraft and GBTS Procurement (BA 03)
 (does not include initial spares)

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	14,007	12,133	9,952	0	36,092
(QTY)	(38)	(42)	(33)	(0)	(113)

(U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604233E
 PE Title: Specialized Undergraduate
 Pilot Training (SUPT)

Project: #4102
 Budget Activity: #4-Tactical Programs

Project Title: Joint Primary Aircraft Training System (JPATS)

JPATS not on contract until FY94; picture not applicable at this time

POPULAR NAME: JPATS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	Joint ASP 1/92	MS 0/I DAB 1/93	Begin SS 11/93 MS II 6/94	MS III 3Q FY98
Engineering Milestones	Early Ops Demo Cancelled 7/92			A/C PDR 1Q FY95 A/C CDR 3Q FY95 OFT PDR 4Q FY95 OFT CDR 2Q FY96
T&E Milestones			Op Eval Begins 11/93	A/C DT&E complete 2Q FY97 A/C MOT&E complete 2Q FY98 OFT DT/OT&E complete 4Q FY98
Contract Milestones		1st A/C DRFP released 2/93 2nd A/C DRFP release 3/93 A/C RFP release 9/93	A/C contract award 7/94 GBTS DRFP release 12/93 GBTS RFP release 8/94	
BUDGET				Program Total
(\$000)	FY 1992	FY 1993	FY 1994	(To Complete)
Major Contract	0	0	40,015	195,564 (155,549)
Support Contract	0	0	0	0
In-House Support	0	0	0	0
GFE/Other	1,063	2,055	1,560	30,467 (25,789)
Total	1,063	2,055	41,575	226,031 (181,338)

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Program Element: #0604233E
 PE Title: Specialized Undergraduate
 Pilot Training (SUPT)

Project: #4102
 Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

JPATS is planned as a joint USAF/USN venture to replace the Services' fleets of primary trainer aircraft (T-37 and T-34 respectively) and associated Ground Based Training Systems (GBTS). The aircraft and GBTS will be used to train entry level student aviators in the fundamentals of flying so they can transition into advanced training tracks leading to qualification as military pilots, navigators, and Naval Flight Officers. The program includes the purchase of aircraft, simulators, and associated ground-based training devices, training management systems, instructional courseware, and logistics support.

CHARACTERISTIC

Syllabus maneuvers, mission profiles
 (Contact, familiarization, precision aerobatics
 instrument, and navigation - high & low)
 Sustained speed (KTAS) at 1000 ft MSL, hot day
 Operational G envelope
 Pressurization (PSI differential)
 Bird strike capability (KTAS) (4 lb bird, no
 catastrophic damage)
 Ejection seat with survival kit (altitude/airspeed)
 Able to perform engine out landing
 Anthropometric accommodation (sitting
 height in inches)
 Able to be flown operationally from either cockpit
 Stepped tandem
 Exterior noise

THRESHOLD

Accomplish all five mission profiles

 250, 270 (dash)
 +6 to -3 symmetric, +4 to 0 asymmetric
 3.5
 270

 0 ft/60 KIAS
 Runway
 34 to 40

 Yes
 Yes
 FAR Part 36, most restrictive applicable
 standard
 IFR certified (selectable ADI/HSI)
 5000

IFR certified instrumentation
 Takeoffs/touch & go/land at main
 operating bases (runway length, ft)

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Joint Acquisition Strategy Panel (JASP) completed
- (U) Completed preliminary Training System Requirements Analysis (TSRA)
- (U) Completed preliminary JPATS/SUPT comparative analysis with Navy ISD study
- (U) Completed Conventional Systems Committee Milestone 0/I review

2. (U) FY 1993 Planned Program:

- (U) Completed DAB Milestone 0/I Review
- (U) Released A/C Draft Request For Proposal (DRFP)
- (U) Release A/C DRFP update
- (U) Release A/C Request For Proposal (RFP)
- (U) Complete final TSRA
- (U) Build GBTS DRFP

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Program Element: #0604233F
PE Title: Specialized Undergraduate
Pilot Training (SUPT)

Project: #4102
Budget Activity: #4-Tactical Programs

3. (U) FY 1994 Planned Program:

- (U) A/C Source Selection
- (U) Milestone II Review
- (U) A/C contract award
- (U) Initiate A/C manufacturing development activity
- (U) Release GBTS RFP

4. (U) Program to Completion:

- (U) This is a continuing program
- (U) Conduct A/C DT&E and MOT&E
- (U) Deliver aircraft
- (U) GBTS source selection and contract award
- (U) Develop courseware
- (U) Develop Computer Based Instruction System (CBIS)
- (U) Develop Operational Flight Trainer (OFT) and other Aircrew Training Devices (ATD)
- (U) Develop Training Management System (TMS)
- (U) Develop Training Software Support Center (TSSC)
- (U) Deliver GBTS components

D. (U) WORK PERFORMED BY:

Training System Program office, Directorate of PEO Programs, Wright-Patterson AFB, OH.
Contractor(s) to be determined.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Aircraft and GBTS RFP, source selections, and contract awards delayed in order to make RFP consistent with Defense Acquisition Board Milestone 0/1 guidance.
3. (U) COST CHANGES: TY funds increased from \$33,500 to \$238,154 due to a Milestone 0/1 review change in acquisition strategy which directed the first aircraft be purchased with RDT&E versus production funding. The funds from PE 604227f for JPATS GBTS (\$83,591 in TY\$) were also moved to PE 604233f.

F. (U) PROGRAM DOCUMENTATION:

- (U) DoD Trainer Aircraft Masterplan, 15 Feb 89
- (U) Joint Statement of Operational Need (JSON), 26 Sep 90
- (U) Memorandum of Agreement (MOA) between the Department of the Navy and the Department of the Air Force, 30 May 91
- (U) Joint System Operational Requirements Document (JSORD) for the Joint Primary Aircraft Training System (JPATS), 22 Oct 91

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Program Element: #0604233E
PE Title: Specialized Undergraduate
Pilot Training (SUPT)

Project: #4102
Budget Activity: #4-Tactical Programs

- (U) Program Management Directive (PMD) for Specialized Undergraduate Pilot Training (SUPT), 18 Mar 92
- (U) Operational Requirements Document (ORD) for JPATS, 3 Apr 92
- (U) Acquisition Program Baseline (APB) Agreement for JPATS, 19 Jan 93
- (U) Acquisition Decision Memorandum (ADM) for JPATS, 19 Jan 93

G. (U) RELATED ACTIVITIES:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Procurement (BA 03):

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
Cost	0	0	0	3,277,011	3,277,011
(Quantity)	(0)	(0)	(0)	(417)	(417)

- (U) Military Construction:

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
Cost	0	0	0	16,500	16,500

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

None

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
- A/C Op Eval (source selection)	Begins Nov 93	None
- A/C DT&E complete	Feb 97	None
- A/C MOT&E complete	Mar 98	None
- GBTS D/OT&E complete	Jul 98	None

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604237E
PE Title: Variable Stability In-Flight
Simulator Test Aircraft (VISTA)

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3308 Variable Stability In-Flight Simulator Test Aircraft (VISTA)	<u>2,062</u>	<u>2,066</u>	<u>5,838</u>	<u>2,000</u>	<u>57,098</u>
Total	2,062	2,066	5,838	2,000	57,098

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program modifies an F-16D to create a high-performance, flying simulator as a replacement for the NT-33A aircraft. For the past 36 years, the research and development flight test community has extensively employed the variable stability NT-33A for pre-first-flight evaluation of advanced aircraft. The NT-33A has been a veritable workhorse with a full schedule of test activities. Its success is directly attributable to its relatively low-cost of operation, rapid response to customer needs, and high degree of credibility in the flight test community. The NT-33A has been credited with identification of flight control deficiencies on the prototypes for the YF-17 and F-18. Undetected, such deficiencies could have resulted in loss of prototype aircraft. The NT-33A needs to be replaced because its performance is not representative of future aircraft (it's the oldest aircraft in the Air Force still actively flying). VISTA, a modified F-16D, will have the capability to simulate a wide range of air vehicles to identify crucial flight control and human factor design deficiencies before first flight.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

(U) Project 3308, Variable Stability In-Flight Simulator Test Aircraft: VISTA will have the capability to simulate a wide range of air vehicles to: identify crucial flight control and human factor design deficiencies before first flight; establish flying qualities specification criteria; and operate as a flying laboratory for flight control and cockpit display research. An interim VISTA configuration will first be used as the testbed for the initial Multi-Axis Thrust Vectoring (MATV) experiment. In addition, the Air Force and Navy Test Pilot Schools will use VISTA, as they have the NT-33A, to safely train test pilots to judge the deficiencies and characteristics for aircraft handling quality, avionics, and human factors in a realistic high performance environment. VISTA will be a national asset for continuing flight research.

(U) FY 1992 Accomplishments:

- (U) Completed aircraft modification tasks including cockpit equipment installation and instrumentation system wiring.
- (U) Completed ground testing for the host mode (basic F-16 system) to ensure design safety requirements have been met.
- (U) Conducted flight readiness review.
- (U) Completed basic functional check flights and Air Force acceptance of basic F-16 system.

(U) FY 1993 Planned Program:

- (U) Complete aircraft modifications for MATV experiment.

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Program Element: #0604237E
PE Title: Variable Stability In-Flight
Simulator Test Aircraft (VISTA)

Budget Activity: #4 - Tactical Programs

- (U) Complete Multi-Axis Thrust Vectoring (MATV) software validation and verification.
- (U) Conduct flight readiness review for MATV flight demonstration.
- (U) Complete MATV flight demonstration.

- (U) FY 1994 Planned Program:
 - (U) Resume and complete developmental flight testing to verify operational performance of final VISTA configuration.
 - (U) Conduct aircraft physical and functional configuration audit.
 - (U) Transition the completed VISTA to flight research.

- (U) Work Performed By: This project is managed by the Flight Dynamics Directorate of the Wright Laboratory, Wright-Patterson AFB, OH. The prime contractor is General Dynamics, Fort Worth Division, Fort Worth, Texas.

- (U) Related Activities:
 - (U) PE 0602201F, Aerospace Flight Dynamics.
 - (U) PE 0603245F, Advanced Flight Technology Integration.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

- (U) Other Appropriation Funds: Not Applicable.

- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604239F

Project: Not Applicable

PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD Budget Activity: #4-Tactical Programs

Project Title: ATF EMD

POPULAR NAME: F-22

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE (\$000)	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones				DAB Review MS III 4QFY2001
Engineering Milestone	Air Vehicle Requirements Review	Air Vehicle PDR	Air Vehicle CDR	First Flight Jun 96
T&E Milestones		First EMD Engine to Test		DT&E IOT&E
Contract Milestones				PPV Long Lead PPV Award
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total* (To Complete)
Major Contracts	1,554,487	1,853,199	2,166,100	13,835,386 (8,261,600)
Support Contracts	1,400	1,500	1,700	21,600 (17,000)
In-House Support	10,000	12,300	12,600	129,100 (94,200)
GFE/Other	40,917	58,200	70,597	738,117 (568,400)
Total	1,606,804	1,925,199	2,250,997	14,724,203 (8,941,200)

Note: The program total reflects FY92-FY01 only. FY91 costs are not included.

() Indicates cost to complete

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Program Element: # 0604239F

Project: Not Applicable

PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The F-22 Program is developing the next-generation air superiority fighter for introduction in the early 2000's to counter emerging proliferating worldwide threats. The F-22 is designed to penetrate enemy airspace and achieve a first-look, first-kill capability against multiple targets. F-22 Engineering and Manufacturing Development (EMD) effort is based on the Weapon System Specification formulated from data developed during the Dem/Val (Prototype) phase. The EMD program consists of design, fabrication, and development testing of 9 EMD flight test vehicles (7 single and 2 dual seat); design, fabrication, development testing, and delivery of 27 EMD flight qualified engines; updating of the Dem/Val Avionics Flying Laboratory into a Flying Test Bed (FTB) and using it to develop and integrate the EMD avionics suite; and design and development of F-22 Weapon System support and training systems. The F-22 program from the outset has placed balanced emphasis on performance, survivability, reliability/maintainability, and affordability. The F-22 is characterized by a low observable highly maneuverable airframe, advanced integrated avionics and a new engine capable of supersonic cruise without using afterburner.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed Air Vehicle Requirements/Design Review Update.
- (U) Completed Prototype Air Vehicles (PAV) flight test.
- (U) Completed Critical Design Review (CDR) for EMD engine.
- (U) Determined baseline for Common Avionics between RAH-66 and F-22.
- (U) Used PAVs and prototype engines to provide loads data for final design iteration.
- (U) Completed Support System Requirements/Design Review Update.
- (U) Initiated fabrication of EMD ground test engines.

2. (U) FY 1993 Planned Program:

- (U) Complete Air Vehicle Preliminary Design Review (PDR).
- (U) Accomplish first EMD engine to test (FETT).
- (U) Avionics system modeling/simulation results available.
- (U) Complete Training Systems Requirement/Design Review Update.
- (U) Initiate fabrication of EMD flight test engines and EMD aircraft #1.
- (U) Continue subsystem design, development and test activity

3. (U) FY 1994 Planned Program:

- (U) Complete Air Vehicle CDR - The last major design review before assembly.
- (U) Complete Initial Production Readiness Review.
- (U) Finalize Flying Test Bed test configurations.
- (U) Continue to fabricate/build Support System equipment for test.
- (U) Continue technical order development.
- (U) Continue development of Block 0 software.
- (U) Conduct Training System integration PDR.
- (U) Continue assembly of EMD aircraft #1.
- (U) Procure major sub-assembly items for EMD aircraft #2, #3, and Static Test aircraft.

4. (U) Program to Completion:

- (U) Fabricate and deliver nine EMD aircraft (FY 1996 to FY 1999)
- (U) Fabricate and test one static article and one fatigue article
- (U) Modify and use Flying Test Bed to support avionics testing

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Program Element: # 0604239F

Project: Not Applicable

PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD Budget Activity: #4-Tactical Programs

- (U) Aircraft testing includes: weapon compatibility, performance, flying qualities, observables, integrated avionics, climatic effects, SEEK EAGLE, support and training systems compatibility, and completion of Development, Test & Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E) (FY 1996 to FY 2001)
- (U) Fabricate and deliver 4 Pre-Production Verification (PPV) aircraft for use in IOT&E
- (U) Milestone III

D. (U) WORK PERFORMED BY: The F-22 EMD program will be managed by the Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH. Contracts have been awarded to Lockheed Aeronautical Systems Corporation in Marietta, Georgia and Pratt & Whitney Corporation in West Palm Beach, Florida.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Program on track to meet Program Design Review in April 93.
2. (U) SCHEDULE CHANGES: The rephased F-22 EMD Program moved the Critical Design Review eleven months to August 94, First Flight to June 96, and Milestone III eleven months to July 2001. The 2-seat aircraft were moved to later in EMD program.
3. (U) COST CHANGES: \$842,619K decrease in total program costs from the Independent Cost Assessment approved at Milestone II. This is driven primarily by new inflation assumptions (2.2% per year), and a reduction in planned EMD aircraft from 11 to 9.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 304-83, Statement of Operational Need (SON) for Advanced Tactical Fighter, 9 Nov 84
- (U) TAF SORD 304-83-I/IIA, System Operational Requirements Document (SORD) Advanced Tactical Fighter, 22 Mar 91
- (U) Program Management Directive (PMD) 7036(17)/0603230F/0604239F, 12 Mar 92
- (U) Advanced Tactical Fighter Test and Evaluation Master Plan (TEMP), 2 Mar 92
- (U) F-22 Acquisition Program Baseline, 3 Feb 92

G. (U) RELATED ACTIVITIES:

- (U) PE 0207219F, F-22 Procurement planned for FY 1997 with advanced buy in FY 1996.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

(U) Aircraft Procurement (BA 4) P-1 Line Item

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
Cost	0	0	0	67,736,700	67,736,700
Quantity				648	648

(U) Military Construction Program

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
Cost	0	0	0	172,200	172,200

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Program Element: # 0604239F

Project: Not Applicable

PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD Budget Activity: #4-Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS): Not Applicable.

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
(U) First Flight	June FY96	
(U) Start combined DT&E/IOT&E Flight Testing		FY96-FY01

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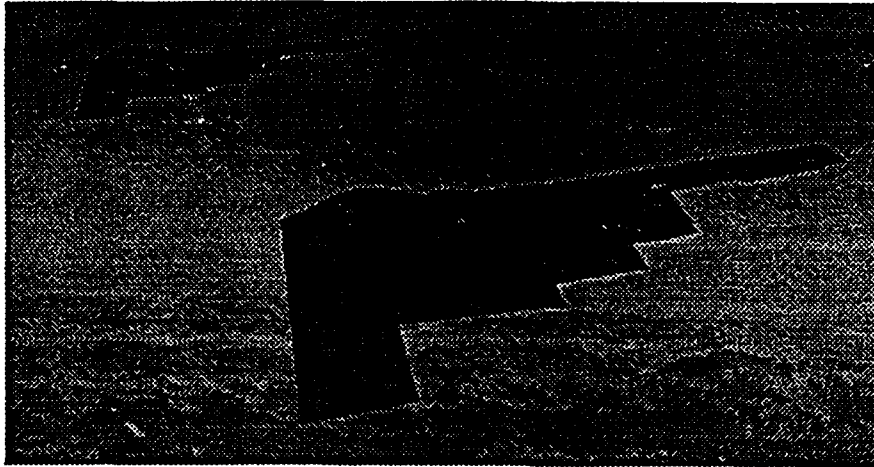
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604240F

Project: NA

PE Title: B-2 Advanced Technology Bomber (ATB)

Budget Activity: #3 Strategic Programs



A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestone	- First Flight AV 4	- First Flight AV 5 - First Flight AV 6	- Block 10 - Dec 93/1st ACC Delivery	- LOC-Jan 95 - Block 20-Jul 96 - Block 30-Jun 97 - Complete Block 30-Sep 01
Engineering Milestone	- FY92 SMM	- FY93 SMM		
T&E Milestone		- Complete AV-6 TOV&V		
Contract Milestone		- GPS Negotiations - Band 4 Negotiations		
Budget (\$000)	FY 1992	FY 1993	FY 1994	Program Total
Major Contract	1167299	926331	549469	1156864
Support Contract	133860	95910	80882	114206
In-House Support	12828	14607	6224	14474
GFE/ Other	208313	152452	153925	469256
Total	1522300	1189300	790500	1754800

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Program Element: #0604240F

Project: NA

PE Title: B-2 Advanced Technology Bomber (ATB)

Budget Activity: #3 Strategic Programs

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The B-2 is a multi-role strategic bomber with exceptional range and payload that is capable of performing both conventional and nuclear delivery roles; however, emphasis is being placed on conventional missions and capabilities. The range of the B-2 allows it to strike targets anywhere in the world with minimum refueling support and reduces our dependence on over-seas basing. The aircraft is equipped with twin weapon bays and has the capability of carrying up to 44,880 pounds of munitions payload. It can carry the full complement of conventional gravity weapons and will have a precision capability using JDAM and TSSAM weapon systems. The B-2's design exploits breakthroughs in low observable technology to achieve reduced vehicle signatures which allow penetration of all current and postulated threats. Deployment of the B-2 will preserve the vitally needed flexibility for worldwide non-nuclear force projection.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY1992 Accomplishments:

- (U) Continued system development through flight test
- (U) System flight testing of navigation and radar systems on KC-135; and air vehicle performance update of navigation subsystem using the Coherent Map Mode of the radar
- (U) Test of the D&DT airframe and static airframe
- (U) Obtained preliminary test data, indicating B-2 performance is well within 20% of preflight predictions

2. (U) FY1993 Accomplishments:

- (U) Successfully demonstrated basic capability of X and KU band transponders
- (U) Completed 80% flight loads survey
- (U) Completed major ultimate static test conditions. Test article taken to failure and demonstrated capability 7% over design

2a. (U) FY1993 Planned Program:

- (U) Complete Defensive Management System (DMS) System 1 Flight Testing
- (U) Continue propulsion flight testing
- (U) Perform high angle of attack envelop expansion flight testing
- (U) Continue system development through flight test of additional air vehicles
- (U) Continue flight testing of navigation and radar systems on KC-135 and in test air vehicle
- (U) Performance flight testing scheduled for last quarter of 1993
- (U) Successfully demonstrated basic capability of X and KU band transponders
- (U) Complete 80% flight loads survey
- (U) Complete major ultimate static test conditions. Test article taken to failure and demonstrated capability 7% over design

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Program Element: #0604240F
PE Title: B-2 Advanced Technology Bomber (ATB)

Project: NA
Budget Activity: #3 Strategic Programs

3. (U) FY1994 Planned Program:

- (U) Continue until Engineering & Manufacturing Development and IOT&E/FOT&E testing is complete
- (U) Testing includes the following areas

Performance: - Heavy weight take-offs
- Three engine performance
- Weapon Terrain Following/Terrain Avoidance testing
Weapons Separation/Accuracy Testing
Detection and Survivability Testing
Anti-Icing Testing
Radar/Navigation Weapon Release Testing
Auto Pilot/Propulsion/Loads Testing
Complete 100% Flight Loads Demonstration Testing

4. (U) Program to Completion:

- (U) Continue until EMD and IOT&E/FOT&E testing is complete
- (U) Final signature, situational awareness achieved
- (U) This is a continuing program

D. (U) WORK PERFORMED BY: The B-2 program is managed by the B-2 System Program Office, Aeronautical Systems Center, Wright-Patterson AFB, Ohio. Northrop Corporation, B-2 Division, Pico Rivera, California is the B-2 prime contractor, and has overall integration responsibility for the development and production of the B-2. Boeing Military Airplane Company, Seattle, Washington, and LTV, Dallas, Texas are major subcontractors developing airframe components. General Electric Company, Aircraft Engine Group, Cincinnati, Ohio is responsible for the development of the B-2 propulsion system. Several government agencies provide specialized assistance to the program. Included in these are the Air Force Materials Laboratory, Air Force Avionics Laboratory at Wright-Patterson, AFB, Ohio, Arnold Engineering Development Center in Tennessee, Air Force Operational Test and Evaluation Center, and Phillips Laboratory at Kirtland AFB New Mexico. The majority of the flight test activity will be accomplished at the Air Force Flight Test Center, Edwards AFB, California and will use numerous Department of Defense test ranges.

E. (U) COMPARISON WITH FY1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES:

- (U) Radar - A new radome has been designed for use with the radar. This design results in a lighter radome with the improved performance necessary to meet existing radar mission requirements. Flight test of this new design started early in 93 on AV-3 after the lay-up. This change is necessary to meet the user's Block 20 requirements.

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Program Element: #0604240F

Project: NA

PE Title: B-2 Advanced Technology Bomber (ATB)

Budget Activity: #3 Strategic Programs

- (U) Communications - Improved communications capability (Secure HF) is being added. Secure HF is a Block 20 user requirement.
 - (U) Navigation - The contract modification has been let with NB2D to integrate the Global Positioning System (GPS) into the B-2. This activity supports user requirements for improved accuracy targeting.
 - (U) Weapons Integration - Nine weapon separations (three B-83, two B-61, and four MK-84) were accomplished. Additional separations are scheduled during FY93 to assure the initial B-83 and MK-84 ACC-1 capability.
 - (U) LO - SecAF approved selection of Option 2 from the LO Closure Plan as the option that meets ACC's operational performance objectives. A trade study will evaluate the optimum balance between mission effectiveness and cost for each Option 2 design element. This trade will determine the specific LO configuration of the Block 30 air vehicles.
 - (U) Rework - The B-2 program will undergo review as OSD considers all acquisition programs in the FY 95-99 "Bottom Up Review." The final results of the review will determine program cost and schedule.
2. (U) SCHEDULE CHANGES: The first flight of AV-5 slipped to Oct 92 causing an extension in the flight test program. Initiatives requiring test and evaluation have extended Flight Test from Dec 96 to Jul 97.
3. (U) COST CHANGES: There has been no change in EMD and Production costs as reflected in the \$44.4 billion program. Fiscal year phasing will be adjusted to reflect a better understanding of the work yet to complete during a future funding cycle.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 007-89-0, dated Feb 1990
- (U) ACC ORD 007-89-I/II/III, dated 3 Dec 1993
- (U) PMD 2020 (11), dated 30 Jun 1992
- (U) System Threat Assessment Report (STAR), dated 1 Apr 93
- (U) B-2 Test and Evaluation Master Plan (TEMP) Draft, dated Dec 92

G. (U) RELATED ACTIVITIES:

- (U) The air crew training devices and mission planning systems for the B-2 are funded in the B-2 baseline and managed by the B-2 System Program Office
- (U) The training devices include Weapon System Trainers, Mission Trainers, and a System Support Center (SSC)
- (U) The mission planning systems include the Aircraft/Cruise Missile Force Application System (AFAS), the Strategic Mission Data Preparation System (SMDPS) and, transition to the Air Force Mission Support System (AFMSS)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

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Program Element: #0604240F

Project: NA

PE Title: B-2 Advanced Technology Bomber (ATB)

Budget Activity: #3 Strategic Programs

H. (U) OTHER APPROPRIATION FUNDS (TY\$Thousands):

- (U) Aircraft Procurement (3010)

<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>To Complete</u>	<u>Total</u>
2,299,900	2,659,800	911,300	2,807,400	20,180,100

- (U) Milcon (3300)

<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>To Complete</u>	<u>Total</u>
25,100	50,200	43,500	50,100	532,300

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

- (U) Not Applicable

J. (U) TEST & EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>EVENT</u>	<u>DATE</u>	<u>RESULT</u>
(U) First Flight	17 Jul 89	Testing upgrades
(U) Initial Block 1 Testing	Summer 90	Successful, basic flying qualities demonstrated
(U) AV-2 First Flight	19 Oct 90	Flight qualities, loads, propulsion, integration, and structural integrity demonstrated
(U) Completion of FY91 SMM Milestone	Jan 91	Preliminary RCS baseline signature assessment successfully accomplished
(U) AV-3 First Flight	18 Jun 91	Avionics systems test

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Program Element: #0604240F

PE Title: B-2 Advanced Technology Bomber (ATB)

Project: NA

Budget Activity: #3 Strategic Programs

(U) Completion of FY92 SMM Milestones

	Dec 91	Additional assessment of RCS baseline data; estimated air vehicle flight update; characteristics; AV-3 radar and navigation functional/integration; ground test weapon compatibility demonstration
(U) AV-4 First Flight	17 Apr 92	Weapons separation
	Sep 92	First weapon separation
(U) AV-5 First Flight	5 Oct 92	Climatic testing, Low Observability, and OT&E Integration
(U) AV-6 First Flight	2 Feb 93	Tech Order Validation and Verification (TOV&V)
(U) AV-2 Marks 1,000th Flight Test Hour	10 Feb 93	
(U) Complete AV-1 LO Closure Plan Validation Flt Test	Mar 93	Validate RCS design

T&E ACTIVITY (TO COMPLETION)

<u>EVENT</u>	<u>DATE</u>	<u>REMARKS</u>
(U) AV-1 Flyable Storage	Mar 93	
(U) AV-7 EMC Testing	May 93	
(U) AV-5 Climatic Testing	Jul 93	

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Program Element: #0604240F
PE Title: B-2 Advanced Technology Bomber (ATB)

Project: NA
Budget Activity: #3 Strategic Programs

(U) FY93 - FY95 SMM
Milestones

Test areas to include further testing in mission performance (Weapons, Nav/Radar), Low Observables, air vehicle performance (aero performance, flying qualities, loads, and air refueling), and Integrated Logistics Support (reliability, maintainability, tech data)

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64242F

Budget Activity: #4-Tactical Programs

PE Title: Advanced Strike/Interdiction Aircraft (AX)

A. (U) RESOURCES (\$ In Thousands)

Project

<u>Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3831 Advanced Tactical Aircraft	1,999	1,890	3,835	TBD*	TBD*

* Program is currently undergoing Concept Exploration & Definition.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The USAF requires a medium range, all-weather, day/night, stealthy interdiction aircraft to replace the F-111, F-117, and F-15E in the 2010 time-frame. The AX will possess a significant increase in survivability, mission effectiveness, reliability, maintainability and supportability over the three aircraft it replaces. The Navy is conducting the Concept Exploration and Definition Phase for an Advanced Strike Aircraft (AX). The USAF intends to study mission and cost effectiveness of AX compared to the aircraft it replaces, and to contract for design trade studies for potentially unique Air Force requirements.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) 3831. Advanced Tactical Aircraft: The USAF plans for the AX Demonstration/Validation Phase are to perform trade studies for potential USAF unique requirements for AX.

(U) FY 1992 Accomplishments:

- (U) Executed with remaining FY 1991 funds and reprogrammed FY 1992 funds identified in Letter of Notification to Authorizations and Appropriations Committees, dated 16 and 18 Dec, 91.
- (U) Initiated USAF AX cost and operational effectiveness analysis.

(U) FY 1993 Planned Program:

- (U) Continue USAF AX cost and operational effectiveness analysis to support the USAF's acquisition plan required at Milestone I.

(U) FY 1994 Planned Program:

- (U) Continue USAF AX cost and operational effectiveness analysis to support USAF's acquisition plan required at Milestone I and prime contractor trade studies for the Demonstration/Validation Phase.
- (U) Initiate design/requirements trade studies to assess technical and cost viability for potentially unique USAF AX requirements.

(U) Work Performed BY: USAF IN-HOUSE: Aeronautical Systems Center, Dayton, OH; Air Force Studies and Analysis Agency, Wash. D.C. AF STUDY CONTRACTOR: Veda Inc., Dayton, OH. NAVY FUNDED CE&D CONTRACTORS: Rockwell International Corp, Los Angeles, CA; McDonnell Douglas Corp, St. Louis, MO; Lockheed Corp, Marietta, GA; Grumman Aerospace Corp, Bethpage, NY; and Lockheed, Ft. Worth, TX.

(U) Related Activities:

- (U) Program Element # 0604233N (ATA/AX).
- (U) Program Element # 0604239F (F-22).
- (U) Program Element # 0604223A (RAH-66).

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- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604243F
PE Title: Manpower, Personnel, and Training Development

Budget Activity: #6 - Defensewide Mission Support

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3816 Pilot Candidate Selection Method (PCSM)	463	30	0	0	5,744
3817 Base Training System (BTS)	843	373	150	154	2,641
3818 Maintenance Skills Tutors (MSTs)	828	2,712	4,688	18,432	32,477
Total	2,134	3,115	4,838	18,586	40,862

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides engineering development of manpower, personnel, and training technologies to improve effectiveness of Air Force training development/delivery, performance assessment, personnel acquisition, job assignment, force management, and human performance in weapon systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3816, Pilot Candidate Selection Method (PCSM): PCSM will provide assessment tools to enable the Air Force to select the best qualified applicants for Specialized Undergraduate Pilot Training. PCSM will field a Test Processing Station and up to 250 computerized test stations, called Basic Attributes Testers (BATS), at Air Force Reserve Officer Training Corps detachments, selected Air Force bases, and Military Entrance Processing Stations. Research by the Armstrong Laboratory has demonstrated that PCSM will produce test scores that are highly predictive of future pilot training performance.

(U) FY 1992 Accomplishments:

- (U) Conducted Equivalency Testing of the 25 prototype BATS.
- (U) Completed development of the Test Processing Station for BATS.
- (U) Conducted Initial Operational Test and Evaluation of BATS.

(U) FY 1993 Planned Program:

- (U) Complete production of the PCSM test devices for Air Training Command.

(U) FY 1994 Planned Program: Not Applicable.

(U) Work Performed By: Project is managed by Human Systems Center, Brooks AFB, TX. The contractor is CTA Inc., Denver, CO.

(U) Related Activities:

- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0804748F, Flight Screening.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3817, Base Training System (BTS): The new and increasingly complex weapon systems and rapidly changing technology combined with major force reductions require personnel to be more efficient

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Program Element: #0604243F
PE Title: Manpower, Personnel, and
Training Development

Budget Activity: #6 - Defensewide
Mission Support

in the performance of their assigned duties. To ensure a high job proficiency, the Air Force needs a more efficient system for training management. Base Training System (BTS) is a computerized management system for all enlisted specialty and officer and civilian ancillary training which will improve management, administration, scheduling, and record keeping. The system is composed of Air Force standard computer hardware and ADA-based applications software.

(U) FY 1992 Accomplishments:

- (U) Produced and installed one prototype BTS system at Randolph AFB.
- (U) Completed three month operational assessment testing of the prototype BTS; further user assessment is ongoing.
- (U) Prepared plans to support additional testing and Air Force-wide implementation of the BTS.
- (U) Completed front-end requirements analysis for a personal computer-based deployable BTS (D-BTS) for deployment, training, and small or classified unit use.

(U) FY 1993 Planned Program:

- (U) Rehost the BTS software on a more cost-effective platform.
- (U) Complete development of the D-BTS and test interface with BTS.
- (U) Update the software and incorporate requirements for Air Force-wide implementation.

(U) FY 1994 Planned Program:

- (U) Complete testing of the BTS at Randolph AFB.
- (U) Install and assess the BTS and the D-BTS at several Air Force Materiel Command locations.
- (U) Complete acquisition strategy approval process for the Air Force-wide BTS implementation.

(U) Work Performed By: This project is managed by the Human Systems Center, Brooks AFB, TX. The contractors are: McDonnell Douglas Training Systems, Aurora, CO; and MEI Technology Corporation, Lexington, MA.

(U) Related Activities:

- (U) PE 0603227F, Personnel, Training, and Simulation Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3818, Maintenance Skills Tutors (MSTs): MSTs are multiple computer-based systems for the Combat Air Forces to improve training of complex maintenance troubleshooting skills for a broad range of Air Force jobs. This involves the more difficult skills of understanding and troubleshooting problems that the maintenance aiding equipment and systems are unable to diagnose.

(U) FY 1992 Accomplishments:

- (U) Conducted trade off analyses between design options to determine the optimal combinations of systems capability, supportability, and maintainability for MSTs.

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Program Element: #0604243F
PE Title: Manpower, Personnel, and
Training Development

Budget Activity: #6 - Defensewide
Mission Support

- (U) Analyzed development and life cycle cost estimates for each design option and determined the most cost-effective system option for Maintenance Skill Tutors (MSTs).
 - (U) Developed and defined a generic MSTs architecture design that identifies the software components which will be common to all tutor implementations, maximizes the re-use of code, and minimizes the development cost of each subsequent MSTs implementation.
- (U) FY 1993 Planned Program:
- (U) Award contract to begin development of MSTs software and the development of tutors for F-15 and F-16 flightline maintenance.
 - (U) Conduct cognitive task analyses to extract and quantify expert knowledge from Air Combat Command F-16 flightline avionics specialists.
 - (U) Develop instructional content and design for three F-16 Flightline Avionics Tutors.
 - (U) Modify and field F-15 Avionics Intermediate Shop Tutor.
 - (U) Modify the F-15 Flightline Pneudraulics Tutor.
- (U) FY 1994 Planned Program:
- (U) Field the first two of three F-16 Flightline Avionics Tutors.
 - (U) Conduct the cognitive task analyses for additional F-16 flightline tutors.
 - (U) Field two F-15 Flightline Avionics Tutors.
 - (U) Field the F-15 Flightline Pneudraulics Tutor.
- (U) Work Performed By: This project is managed by Human Systems Center, Brooks AFB, TX. The contractors are to be determined.
- (U) Related Activities:
- (U) PE 0602205F, Personnel, Training, and Simulation.
 - (U) PE 0603227F, Personnel, Training, and Simulation Technology.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604249F
PE Title: Night/Precision Attack

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
2693 LANTIRN	1,786	6,700	21,429	3,861	561,910
3920 Night Attack Program (NAP)	<u>1,339</u>	<u>18,394</u>	<u>60,781</u>	<u>238,894</u>	<u>330,570</u>
Total	3,125	25,094	82,210	242,755	892,480

B. (U) BRIEF DESCRIPTION OF ELEMENT: The program element contains two separate projects which contribute to Air Force capabilities to conduct successful interdiction and Close Air Support (CAS) mission. Development funds complete the ongoing LANTIRN (Low Altitude Navigation and Targeting InfraRed for Night (LANTIRN) program with integration and development flight testing on F-15E and F-16 Block 40 production aircraft. It provides the Combat Air Forces the capability to conduct CAS and interdiction missions at night and in conditions of limited visibility with precision laser guided weapons. The Night Attack program will develop, test, and evaluate night vision technologies for future enhancement to F-16 and A-10 aircraft.

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Program Element: #0604249F
PE Title: Night/Precision Attack

Project Number: 2693
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
LANTIRN	1,786	6,700	21,429	3,861	561,910

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The need for LANTIRN is documented in Tactical Air Forces' Statement of Operational Need 302-81, Night Attack Capabilities. LANTIRN responds to that need by providing the capability to conduct close air support and interdiction missions at night and under-the-weather for F-15E and F-16C/D fighter aircraft. LANTIRN provides the capability not only to attack at night, but also to attack with precision laser guided weapons day or night and in conditions of limited visibility. The LANTIRN program includes development and testing of a wide angle raster head-up display, a navigation pod, and a targeting pod. The navigation pod contains a terrain following radar and a fixed forward looking InfraRed (FLIR) sensor; the targeting pod contains a gimballed FLIR, a laser designator, an automatic tracker, a missile boresight correlator, and growth provisions for an automatic target recognizer.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:
 - (U) Continued integration and development flight testing of LANTIRN/F-15E and the F-16 Block 40/42 production aircraft.
 - (U) Developed corrective actions for discrepancies identified in field service reports on F-16 and F-15E aircraft
 - (U) Initiated test program to determine technical causes of pod deficiencies observed in Desert Storm.
2. (U) FY 1993 Planned Program:
 - (U) Continue integration and development flight testing of LANTIRN/F-15E and the F-16 Block 40/42 production aircraft.
 - (U) Implement flight test software changes resulting from initial operational use of the targeting pod.
 - (U) Initiate development activities for incorporating a laser spot tracker capability into targeting pod for the F-16 Block 40/42 production aircraft.
 - (U) Develop, evaluate, integrate, and flight test hardware/software solutions to pod deficiencies observed in Desert Storm.
3. (U) FY 1994 Planned Program:
 - (U) Continue development of targeting pod laser spot tracker capability for incorporation into the F-16 Block 40/42 production aircraft.
 - (U) Conduct studies to determine acceptable substitutes for OLDS (Ozone Layer Depleting Substances) contained in the LANTIRN system.
 - (U) Complete development, evaluation, integration, flight test, documentation and fielding of hardware/software corrections to pod deficiencies observed in Desert Storm.
 - (U) Identify corrective actions to discrepancies identified in field service reports.
 - (U) Flight test software changes resulting from anticipated changes in the F-16 and F-15E software suites.
 - (U) Initiate planning for production of laser spot tracker capability for F-16 Block 40/42 production aircraft.

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Program Element: #0604249F
PE Title: Night/Precision Attack

Project Number: 2693
Budget Activity: #4 - Tactical Programs

4. (U) Program to Completion:
- (U) Continue flight testing of software changes resulting from changes in the F-16 and F-15E software suites as well as those required to ensure the LANTIRN system remains compatible with F-15E and F-16 Block 40/42 aircraft.
 - (U) Complete development activities for incorporating a laser spot tracker capability into targeting pod for the F-16 Block 40/42 production aircraft.
 - (U) Complete production plans for incorporating a laser spot tracking capability into F-16 Block 40/42 production aircraft.
- D. (U) Work Performed By: The LANTIRN program office is located at Aeronautical Systems Center, Wright-Patterson Air Force Base, OH. The LANTIRN prime contractor is Martin Marietta, Orlando, FL. Major subcontractors include Texas Instruments, Dallas, TX, for the terrain following radar; Delco Systems Operations, Goleta, CA for the advanced pod control computer; Litton Laser Systems, Apopka, FL for the laser designator ranger; Litton Poly-Scientific, Blacksburg, VA for the dual slip ring and rotary fluid joint; and Sunstrand Power Systems, San Diego, CA for the environmental control unit. F-16/LANTIRN integration work is performed by the General Dynamics Corp., Ft. Worth, TX. F-15E/LANTIRN integration work is performed by the McDonnell Douglas Corp., St Louis, MO.
- E. (U) COMPARISON WITH FY1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTIVE OF CHANGES

1. (U) TECHNICAL CHANGES: The Air Force elected to use an enhanced LANTIRN equipped F-16 Block 40/42 aircraft for the Close Air Support (CAS) mission in lieu of upgrading the F-16 Block 30. To support this mission the LANTIRN program will develop and incorporate a laser spot tracking (LST) capability into the targeting pod.
2. (U) SCHEDULE CHANGES: Plans to initiate development of a targeting pod laser spot tracker capability has been held in abeyance until concerns about the F-16 Close Air Support program are resolved.
3. (U) COST CHANGES: None
- F. (U) PROGRAM DOCUMENTATION:
- (U) Tactical Air Forces Statement of Need 302-81, 2 Nov 82 and Amendment 1, 29 Dec 86 (S)
 - (U) System Operational Requirements Document 301-81-I/II/III-A for LANTIRN, 20 Oct 89 (S)
 - (U) LANTIRN Acquisition Program Baseline, 31 Jan 92
- G. (U) RELATED ACTIVITIES:
- (U) Program Element 0207249F, LANTIRN Procurement
 - (U) Program Element 0207133F, F-16 Squadrons.
 - (U) Program Element 0207134F, F-15E Squadrons.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
 - (U) Joint Potential Designator is not applicable (LANTIRN is a post MS IIIB program).
- H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):
- (U) Aircraft Procurement (BA 07, P-1 70):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	6,899	4,109	25,962	19,894	3,347,349

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Program Element: #0604249F
PE Title: Night/Precision Attack

Project Number: 2693
Budget Activity: #4 - Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U)	Full Rate Production Decision (Navigation Pod)	Oct 86
2. (U)	Complete FOT&E	Apr 87
3. (U)	Full Rate Production Decision (Targeting Pod)	Dec 88
4. (U)	Required Assets Available (Navigation Pod)	Sep 89
5. (U)	Required Assets Available (Targeting Pod)	Dec 90
6. (U)	Final Delivery (Navigation Pod)	Mar 92
7. (U)	Software Release for FY93 OFP (F-16 Block 40/42 & F-15E)	Mar 93
8. (U)	Flight Test Complete (FY93 OFP Release)	Nov 93
9. (U)	Organic Depot (Target Pod)	1st Qtr FY94
10. (U)	Organic Depot (Support Equipment)	1st Qtr FY94
11. (U)	Final Delivery (Target Pod)	4th Qtr FY94
12. (U)	Software Release for FY95 OFP (F-16 Block 40/42 & F-15E)	2nd Qtr FY95
13. (U)	Software Release for FY97 OFP (F-16 Block 40/42 & F-15E)	4th Qtr FY96

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Program Element: #0604249F
PE Title: Night Precision Attack

Project Number: #3920
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Night Attack Program (NAP)	1,339	18,374	60,781	238,894	330,570

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The need for enhanced night attack capabilities is documented in TAF SON 312-88 (10 May 89) for a Follow-on Close Air Support (CAS) aircraft. This project contains funding in FY94 to support a Block 30, Head-Steered InfraRed System/Helmet Mounted Display (HSIR/HMD) equipped F-16 and a Forward Looking InfraRed (FLIR) enhancement to the A-10 if the Defense Acquisition Board decides on that approach in the Summer of 1993.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (u) Several study efforts begun under the NAP program completed.

2. (U) FY 1993 Planned Program:

- (U) Begin development pending USD(A) decision.
- (U) Specific programmatic tasks will be scheduled upon USD(A) decision on course of action.

3. (U) FY 1994 Planned Program:

- (U) Continue development and testing.

4. (U) Program to Completion:

- (U) Complete development
- (U) Conduct DT&E and IOT&E.

D. (U) WORK PERFORMED BY: Contractors are undetermined at this time. The F-16 program office, Aeronautical Systems Division, Wright-Patterson AFB OH will select required contractors.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: This program is an alternative to the current lower cost Block 40 Night Attack F-16 and night attack enhancements to the A-10.
2. (U) SCHEDULE CHANGES: Development is on hold pending USD(A) decision.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) PMD 9257(2)/64249F/27437F, 27 Feb 90.
- (U) TAF SON 312-88, 10 May 89.
- (U) PBD #712, 21 Dec 92.

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Program Element: #0604249F
PE Title: Night Precision Attack

Project Number: #3920
Budget Activity: #4 - Tactical

G. (U) RELATED ACTIVITIES:

- (U) PE 0207131F, A-10 Squadrons.
- (U) PE 0207133F, F-16 Squadrons.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE

1. (U) CAS DAB Decision
2. (U) All Other Activities

May-Jun 93
TBD

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604256F
 PE Title: Threat Simulator Development

Budget Activity: #6 - Defense-Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
1209 * EMP Simulation Test Facilities	2,547	2,755	0	N/A	N/A
2064 ** HAVE NOTE	961	944	0	Cont	TBD
3321 *** Electronic Combat Test Resources	0	0	28,338	Cont	TBD
6510 *** Flight Test Threat Systems Simulators	0	0	6,024	Cont	TBD
Total	3,508	3,699	34,362	Cont	TBD

* This project was funded by PE 0604747F in FY 1992/1993. Responsibility for these facilities was transferred to the Army in FY 1994.

** This project was funded by PE 0604747F in FY 1992/1993.

*** These projects were funded by PE 0604735F in FY 1992/1993.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE includes on-going electronic combat test efforts previously funded in PE 0604747F and PE 0604735F. This PE funds the test infrastructure necessary to support the AF Electronic Combat (EC) Test Process. This test process provides a methodology to ensure the effective disciplined and efficient testing of AF EC and avionics systems in support of the acquisition process. Each capability or facility improvement is pursued in concert with the others so as to avoid duplicate capabilities while at the same time producing the proper mix of test resources needed to support the AF EC Test Process. Tasks include the management and technical oversight of implementation activities, AF support of the tri-Service effort to institutionalize a common acquisition modeling and simulation architecture, measurement facilities operation and improvements, hardware in the loop test facilities operation and improvements, installed system test facility improvement, and development, instrumentation and improvement of open air threat simulators and actuals for flight testing.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) 1209. EMP Simulation Test Facilities:
 Funded acquisition and support of the Phillips Laboratory test facilities which simulate nuclear Electromagnetic Pulse (EMP) environments in which weapon systems may be required to operate. The principal EMP simulators used to test aircraft and large missiles are the Vertically and Horizontally Polarized Dipoles and the TRESTLE. The Air Force Weapons Lab (AFWL)/Los Alamos Electromagnetic Calibration and Simulation (ALECS) Facility, a smaller simulator, is used to test small missiles and communications equipment.

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Program Element: #0604256F
PE Title: Threat Simulator Development

Budget Activity: #6 - Defense-Wide
Mission Support

- (U) FY 1992 Accomplishments:
 - (U) Continued Electromagnetic Compatibility Analysis Facilities (EMCAF) support.
 - (U) Initiated planning for B-2 Systems Level EMP testing.
 - (U) Conducted B-2 Fuse Test.
 - (U) Maintained capability to support MAJCOM EMP T&E and operational support requirements as required.
- (U) FY 1993 Planned Program:
 - (U) Plan for B-2 System Level EMP testing.
 - (U) Conduct B-1B hardness maintenance and surveillance test.
 - (U) Maintain capability to support MAJCOM EMP T&E and operational support requirements as required.
 - (U) Continue EMCAF support.
- (U) FY 1994 Planned Program: Not applicable. (Management responsibility of these facilities has been transferred to the Army.)
- (U) Work Performed by: Project 1209 was managed by the Phillips Laboratory, Kirtland AFB, NM. BDM International, Inc., McLean, VA, was facilities support contractor.
- (U) Related Activities:
 - (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): None.
- (U) International Cooperative Agreements: None.
- 2. (U) Project 2064, HAVE NOTE: Developed, improved and supported the Rome Laboratory Electromagnetic Radiation (EMR) test facilities including an anechoic chamber for free space electromagnetic environments simulations; a mode-tuned reverberation chamber for rapid "quick look" evaluations; a small anechoic chamber for fuse and subsystem evaluations; and a radio frequency (RF) and microwave instrumentation development facility. The electromagnetic susceptibility data produced at these facilities is used to perform weapon system and C3I system vulnerability assessments and update test methods, acquisition specifications, hardening design guidelines, and maintenance of technical orders.
 - (U) FY 1992 Accomplishments:
 - (U) Began vulnerability evaluations of the Improved Data Link (IDL) for the GBU-15/AGM-130 and AGM-130 weapon.
 - (U) Continued Advanced Medium Range Air-to-air Missile (AMRAAM) support to program office for the AMRAAM Producibility Enhancement Program (APREP).
 - (U) Began reverberation chamber measurement methodology study.
 - (U) Began support to Sensor Fuzed Weapon (SFW) production program.
 - (U) Completed F-16 Phase III HPM measurements and assessment.
 - (U) Continued Automated Data Acquisition and Control System (ADACS) hardware replacement. Started software system integration.
 - (U) Began revision of MIL-HDBK-335, "Guide to Weapon System Hardening."

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Program Element: #0604256F
PE Title: Threat Simulator Development

Budget Activity: #6 - Defense-Wide
Mission Support

- (U) Completed Reverberation Chamber low frequency capability improvements, extensions, and upgrades.
- (U) FY 1993 Planned Program:
 - (U) Complete vulnerability assessments of GBU-15/AGM-130 IDL
 - (U) Begin support to AGM-137 program.
 - (U) Begin vulnerability evaluations of APREP hardware.
 - (U) Complete vulnerability assessment of SFW production hardware.
 - (U) Continue ADACS hardware replacement.
 - (U) Begin anechoic chamber RF source and control upgrade.
 - (U) Provide ultrawideband pulse capability.
 - (U) Complete one megawatt manegtron upgrade.
 - (U) Begin assessment of AGM-130 standoff weapon.
- (U) FY 1994 Planned Program: Not applicable.
- (U) Work Performed by: Rome Laboratory, Griffiss Air Force Base, NY. The facility and engineering support contractor is Rome Research Corporation, New Hartford, NY.
- (U) Other Appropriation Funds (\$ in Thousands): Not applicable.
- (U) International Cooperative Agreements: None.
- 3. (U) Project 6510, Flight Test Threat Systems Simulators: This project funds those simulators necessary to support the flight test portion of the AF EC Test Process including the development of advanced signal sources to represent ground and airborne threats and the upgrade of existing threat simulators to maintain currency with the latest intelligence. This project is the AF portion of a coordinated tri-Service threat simulator development strategy.
 - (U) FY 1992 Accomplishments: Not applicable.
 - (U) FY 1993 Planned Program: Not applicable.
 - (U) FY 1994 Planned Program:
 - (U) Continue development of an Advanced Airborne Interceptor Simulator (AAIS) begun in FY 93 by OSD Central Test and Evaluation Investment Program (CTEIP). Conduct AF analyses of technical approaches for meeting requirements, evaluating existing simulation and actual hardware systems, preparing request for proposal and conducting source selection.
 - (U) Incorporate the latest intelligence information into the SADS XI, SADS XI (Missile), SADS VI (Missile). Instrument the SADS V (Missile), SADS IV (Radar) and SADS VI (Radar). Integrate into existing facilities on the Electromagnetic Test Environment (EMTE) Range at Eglin AFB, FL. In conjunction with the Army lead, develop a transportable advanced signal source representing the SA-15.
- (U) WORK PERFORMED BY: This project is managed by the 46th Test Wing, Eglin AFB, FL. Major contractors are Georgia Institute of Technology, Atlanta, GA; Environmental Research Institute of Michigan; Dynetics, Huntsville, AL; Sverdrup, Ft. Walton Beach, FL.

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Program Element: #0604256F
PE Title: Threat Simulator Development

Budget Activity: #6 - Defense-Wide
Mission Support

(U) RELATED ACTIVITIES:

- (U) Continues FY 1992/1993 activities in PE 0604735F, Range Improvements.
- (U) Navy and Army also engage in threat simulator development.
- (U) All USAF requirements for threat simulators, and all developments proposed for inclusion in this project, are reviewed by the CROSSBOW-S Committee reporting to the DoD Executive Committee on Threat Simulators (EXCOM). AAIS is jointly funded from OSD (CTEIP) and AF program elements.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS (\$ In Thousands): Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

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Program Element: #0604256F
 PE Title: Threat Simulator Development

Project Number: 3321
 Budget Activity: #6 - Defense-Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands)

Project Title: Electronic Combat Test Resources

<u>Popular Name</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
(N/A)	*	*	28,338	Cont	TBD

* Funds were provided from PE 0604735F, Range Improvement.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AF requires a comprehensive set of ground test facilities to implement the Air Force EC Test Process. In order that program risk throughout the weapon system acquisition life cycle is managed effectively and flight testing is conducted effectively and efficiently, a range of ground test capabilities from modeling and simulation architecture to installed system test facility are required. The EC Test Process Support task provides for management, and coordinated technical oversight of the investment in and application of EC test facilities including analyses, studies and related documentation. One objective of this oversight is to ensure all projects adhere to interface standards and common architectures. The Joint Modeling and Simulation System (J-MASS) is an Air Force-led, Tri-Service project to establish a DoD-wide common digital simulation architecture in support of test and evaluation. Uses reusable ADA language modules and object oriented structure. This standard architecture will provide for credibility and correlation of test and evaluation results for all phases of the weapon system acquisition life cycle. The Hardware in the Loop (HITL) test facilities evaluate electronic support and countermeasures effectiveness prior to installation on the aircraft. Together the two AF HITL facilities, the Air Force Electronic Warfare Evaluation Simulator (AFEWES) and the Real-Time Electromagnetic Digitally Controlled Analyzer and Processor (REDCAP), provide the ability to realistically evaluate hardware components against manned hardware threat representations early enough to affect final system design. The Electronic Combat Integrated Test (ECIT) project upgrades the AF installed system test facility (ISTF) at Edwards AFB, CA. The ISTF provides for thorough weapon system evaluation in a large instrumented anechoic chamber prior to and during flight test. The ability to test Electronic Counter-countermeasures (ECCM) effectiveness of weapons systems is also supported by this project. ECCM test capabilities are developed and incorporated at the Electromagnetic Test Environment (EMTE), Eglin AFB, FL. Finally, this project supports the antenna pattern measurement test facilities at Rome Lab, NY. These measurements provide data needed by other test facilities and program offices to support system design and testing.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments: Not applicable.
2. (U) FY 1993 Planned Program: Not applicable.
3. (U) FY 1994 Planned Program:
 - (U) EC Test Process Support. Further analyze existing test facility capabilities to support AF EC Test Process. Evaluate consolidation alternatives, including electronic linking. Establish an architecture for a distributed simulation capability.

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Program Element: #0604256F
PE Title: Threat Simulator Development

Project Number: 3321
Budget Activity: #6 - Defense-Wide
Mission Support

including standard test configurations and environments. Investigate mechanisms to link test facilities for simultaneous testing including Defense Internet Simulation protocols established by the ARPA WAR BREAKER project. Improve inter-facility correlation of test results. Improve EC Test Process implementation.

- (U) J-MASS. Continue development of enhanced modeling and simulation architecture to support many-on-many simulations and full variety of AF EC Test Process requirements. Incorporate capability to support real-time and non real-time applications and all levels of fidelity. Integrate real-time J-MASS models into the ARPA WAR BREAKER simulation.
- (U) AFEWES operation and upgrade. Continue operation of the AFEWES in support of Army, Navy, Air Force and non-DoD customers. Continue Reconfigurable Airborne Interceptor (RAI) simulator. Continue work on Reconfigurable Surface to Air Missile (RSAM) simulator. Continue work on Test Director System.
- (U) REDCAP operation and upgrade. Continue REDCAP operations in support of Army, Navy, Air Force and non-DoD customers. Upgrades suspended until FY 95 due to funding reductions.
- (U) ECIT. Continue development of generic EC and avionics installed system test capabilities. Begin development of RF target generator system. Begin development of phase measurement capability. Begin development of electro-optical/infrared (EO/IR) target generator. Begin technology development and trade studies of alternatives for risk reduction.
- (U) ECCM. Complete GWEF GPS link to provide time-space position information for ECCM analysis. Complete reconfigurable ground jammer for EMTE ECCM testing.
- (U) Rome Lab. Conduct multi-spectral upgrade to support F-22 avionics development at Newport site. Install fiber/optics upgrade at Verona/Stockbridge site.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Portions of this project are managed by ASC, Wright-Patterson AFB, OH; 46 Test Wing, Eglin AFB, FL; Rome Laboratory, Griffiss AFB, NY; and the AFFTC, Edwards AFB, CA. Major contractors include Lockheed Corporation, Fort Worth, TX (AFEWES); Calspan Corporation, Buffalo, NY (REDCAP); Hughes Aircraft Corporation, Los Angeles, CA; Georgia Tech Research Institute, Atlanta, GA, and Rome Research Corp., Rome, NY.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Investment strategy refocused on supporting AF EC Test Process. Provides unifying criteria for all EC test facility improvements. Introduced EC Test Process support task. Initiated the investigation of distributed simulation architectures, utilizing WAR BREAKER protocols as appropriate. Resumed direct AF Service participation in the J-MASS project. AFEWES resumed work on RSAM project (previously suspended due to FY 93 program restructure).
2. (U) SCHEDULE CHANGES: Rome Lab: F-22 testbed delivery delayed until 2Q93 because of platform unavailability. REDCAP upgrades for FY 94 were delayed until FY 95. RTF upgrades suspended indefinitely due to lack of funds.

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3. (U) COST CHANGES: None.
- F. (U) PROGRAM DOCUMENTATION:
(U) AFOTEC/AFSC/SAC/AFSOC MNS: Weapon System Test Capability, 12 May 92
(U) AFSC SON 004-89, Electronic Combat Integrated Test Capability, 6 Dec 89
- G. (U) RELATED ACTIVITIES:
(U) Continues FY 1992/1993 activities in PE 0604735, Range Improvements.
(U) Navy and Army also engage in electronic combat T&E infrastructure development programs.
(U) All USAF threat simulator programs, including portions of this project are reviewed by the CROSSBOW-S Committee and the DoD Executive Committee on Threat Simulators (EXCOM).
(U) USAF threat simulator linking activities apply ARPA WAR BREAKER distributed interactive simulation (DIS) protocols if applicable.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands): Not Applicable.
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.
- J. (U) MILESTONE SCHEDULE:
- | | |
|--|---------------|
| 1. (U) Demonstrate J-MASS prototype architecture operation. | 3rd Qtr FY 93 |
| 2. (U) ECCM GWEF GPS link complete. | 4th Qtr FY 93 |
| 3. (U) AFEWES TDS IOC. | 2nd Qtr FY 94 |
| 4. (U) AFEWES RAI upgrade IOC. | 3rd Qtr FY 95 |
| 5. (U) REDCAP SUAWACS/BMC3 project complete. | 3rd Qtr FY 95 |
| 6. (U) J-MASS enhanced architecture development complete. | 4th Qtr FY 95 |
| 7. (U) Rome Lab multi-spectral capability to support F-22 complete. | 4th Qtr FY 95 |
| 8. (U) REDCAP IADS IOC. | 2nd Qtr FY 96 |
| 9. (U) ECIT EO/IR target generators & test director comm complete. | 3rd Qtr FY 96 |
| 10. (U) REDCAP Architecture/Link project upgrade IOC. | 3rd Qtr FY 96 |
| 11. (U) ECIT infrastructure, generic test cap, and RF tgt generator available. | 2nd Qtr FY 97 |
| 12. (U) AFEWES RSAM project complete. | 4th Qtr FY 97 |
| 13. (U) AAIS Initial Operational Capability. | 4th Qtr FY 98 |
| 14. (U) ECIT Phase measurement & RCS R&M tasks complete. | 4th Qtr FY 98 |
| 15. (U) ECIT Multi-spectral correlation/measurement capability available. | 4th Qtr FY 99 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258F
PE Title: Target Systems Development

Budget Activity: 6 - Defense-Wide
Mission Support

A. (U) RESOURCES: (\$ in Thousands)

Project Number & Title	FY 1992* Actual	FY 1993* Estimate	FY 1994 Estimate	To Complete	Total Program
2459, Target Payload Systems	4,921	3,659	2,582	Cont	TBD
3165, Full Scale Aerial Target Systems	<u>14,428</u>	<u>16,900</u>	<u>7,572</u>	<u>Cont</u>	<u>TBD</u>
Total	19,349	20,559	10,154	Cont	TBD

* Prior to FY94, these efforts were funded under PE 0604211F, Advanced Aerial Targets Development. The change in nomenclature reflects an administrative change to assign related efforts in all Services the same PE number and title.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Aerial Targets are essential to ensure air-to-air weapons effectiveness and mission proficiency of our tactical aircrews against enemy aircraft. The overall objective is to improve air-to-air weapon system accuracy and reliability by developing aerial target systems for Air Force weapon system test and evaluation.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY1994:

1. (U) Project 2459, Target Payload Systems: Full-scale and subscale targets require payload subsystems for missile scoring, electronic and IR countermeasures, and radar and IR signature augmentation. Current scoring systems provide only miss distance information. The tri-service system under development provides missile path and position relative to the target at point of closest approach, which are essential to accurately calculate the probability of kill. Radar signature augmentation provides radar signatures for subscale targets representative of threat aircraft. IR signature augmentation on subscale targets provides a signature representative of threat military jet engines. Electronic and IR countermeasures (ECM & IRCM) include systems such as chaff and flare dispensers.

(U) FY 1992 Accomplishments:

- (U) Continued update of ground control system interface for subscale targets
- (U) Joined tri-service development program for non-cooperative vector scoring
- (U) Canceled Plume Radiating Infrared Survivability Mechanism -- requirements changed
- (U) Canceled Missile End Game Scoring System (MEGS) -- production transition problems
- (U) Initiated study of radar cross section enhancements for improved target realism

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Program Element: #0604258F
PE Title: Target Systems Development

Budget Activity: 6 - Defense-Wide
Mission Support

(U) FY 1993 Planned Program:

- (U) Continue to participate in tri-service development of non-cooperative vector scoring
- (U) Complete feasibility study for economical mid scale target (MSAT) concept
- (U) Complete feasibility study for target radar signature (RCS) modification, "DREEM"
- (U) Continue efforts to improve target realism and survivability
- (U) Begin consolidation of Aerial Targets management to increase efficiency

(U) FY 1994 Planned Program:

- (U) Continue to participate in tri-service development of non-cooperative vector scoring
- (U) Initiate follow-on efforts based on results of MSAT and RCS modification studies
- (U) Collect and compile target signature data for use in test planning

(U) Work Performed By: Environmental Research Institute of Michigan (ERIM), Ann Arbor MI, and Mirage Systems, Sunnyvale CA, for the DREEM RCS study; Analytic Services Inc, Arlington VA for the MSAT study.

(U) Related Activities:

- (U) PE 0305116F Aerial Target Procurement
- (U) Formal interservice coordination through the Joint Logistics Commanders, Joint Commanders Group for Test & Evaluation, and the proposed Joint Target Oversight Council ensures that there is no unnecessary duplication of effort within the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

- (U) Production funding is provided by host target system.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3165. Full Scale Aerial Target Systems: Aerial Targets are essential to ensure air-to-air weapons effectiveness and mission proficiency of our tactical aircrews against enemy aircraft. The overall objective is to improve air-to-air weapon system accuracy and reliability by developing aerial target systems for Air Force weapon system test and evaluation. In addition, full-scale targets (currently QF-106) are used to support US Army air defense test and evaluation programs such as the Divisional Air Defense follow-on program, Stinger, Patriot and Improved Hawk. The targets being developed provide a cost effective mix of capabilities. Full-scale targets are fully representative of the threat, with realistic maneuvering performance, radar cross section and afterburning engine infrared (IR) signature. Subscale targets are a lower cost supplement used when threat simulation fidelity is not as critical. An Air Force led tri-service program for QF-4 development provides follow-on to the QF-106 full-scale target which will complete procurement in FY 1993.

(U) FY 1992 Accomplishments:

- (U) Contract awarded 4 February 1992
- (U) Completed QF-4 development through Preliminary Design Review

(U) FY 1993 Planned Program:

- (U) Complete development of basic QF-4 system
- (U) Develop common tri-service flight termination system
- (U) Begin contractor flight test

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Program Element: #0604258F
PE Title: Target Systems Development

Budget Activity: 6 - Defense-Wide
Mission Support

(U) FY 1994 Planned Program:

- (U) Complete development of electronic countermeasures (ECM) pod
- (U) Begin Government DT&E/IOT&E at Tyndall AFB for the integrated QF-4 system
- (U) Complete testing of mobile control station

(U) Work Performed By: Tracor Systems Division, Austin, TX, for the QF-4 and Northrup, Chicago, IL for the ECM payload systems.

(U) Related Activities:

- (U) PE 0305116F Aerial Target Procurement.
- (U) Interservice coordination through Joint Logistics Commanders, Joint Commanders Group for Test & Evaluation [JCG(T&E)] and Joint Target Oversight Council (JTOC).
- (U) Formal coordination through the Test and Evaluation Reliance and Investment Board (TERIB) ensures there is no unnecessary duplication.

(U) Other Appropriation Funds (\$ In Thousands):

- (U) Missile Procurement, BSA 4203 (Target Drones):

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
WSC:M106QF (QF-106)					
Cost:	0	30,425			96,817
Qty:	0	40	0	0	184
WSC: M34ABQ (BQM-34A)					
Cost:	24,739				Approx. \$300 Million
Qty(2):	42	0	0	0	(Then-Year \$)
WSC: MQM107 (MQM-107E)					
Cost:	0	29,443	26,314	Cont	TBD
Qty(2):	0	84	60		
WSC: M04AQF (QF-4)					
Cost:		6,000*	4,653		
Qty:	0	0	0	Cont	TBD

* FY93 QF-4 funds were added by Congress to procure decoys (not related to QF-4 program)

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604268F Project Number: N/A
PE Title: Aircraft Engine Component Budget Activity: #4 - Tactical
Improvement Program (CIP) Programs

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Aircraft Engine Component Improvement Program (CIP)	110,854	104,096	102,704	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

CIP provides critical sustaining engineering support (only source) for in-service Air Force engines to maintain flight safety (highest priority), to correct service-revealed deficiencies, to improve system Operational Readiness (OR) and Reliability and Maintainability (R&M), to reduce engine Life Cycle Cost (LCC), and to keep older engines operational. Historically, aircraft systems change missions, tactics, and environments to meet changing threats throughout their lives. Numerous new problems arise through actual use during deployment, production, and service; CIP provides funds to develop fixes for these problems. CIP typically starts with acceptance of the first production engine and continues over the engine's life, gradually decreasing to a minimum level (safety/depot repairs) sufficient to keep older inventory engines operational. CIP addresses usage and life not covered by engine warranty and enables the Air Force to obtain improved warranties when manufacturers incorporate CIP improvements into production engines. Since changes continue throughout a system's operational life, CIP must be maintained at a level to provide the engineering support to make changes which are essential for satisfactory system performance at affordable costs. Typically, CIP efforts potentially reduce outyear Operations and Maintenance (O&M) and spares costs by a ratio greater than 21 to 1, if all modifications are approved as planned. O&M and spares budgeting assumes a viable CIP effort is in place. Without the outyear cost avoidance provided by CIP, outyear support costs would have to be increased drastically. CIP funding is driven by field events and types/maturity of engines, not by the total engine quantity.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued effort to reduce air aborts, aircraft safety incidents, non-mission-capable rates, scheduled and unscheduled engine removals, maintenance man hours, and overall costs.
- (U) 7634 test hours (6440 sea level, 1194 altitude, 140 flight test) to analyze, verify, and qualify CIP tasks.
- (U) 628 CIP tasks (234 redesign tasks, 312 repair tasks, 82 analysis tasks) generating a potential \$3.1B LCC savings.
- (U) F100 (F-15/F-16): Designed new copper/nickel plasma spray coating for bearing surfaces of titanium disk retention lugs to prevent galling and induced disk lug fractures and subsequent engine damage - \$37.0M LCC savings.

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Program Element: #0604268F
PE Title: Aircraft Engine Component
Improvement Program (CIP)

Project Number: N/A
Budget Activity: #4 - Tactical
Programs

- (U) F110 (F-16): Redesigned high pressure compressor variable stator vane to prevent lever arm pin disengagement and subsequent engine damage - \$71.8M LCC savings.
- (U) TF30 (F-111): Completed redesign of combustor with new material to double component life from 750 hours to 1500 hours, reduce unscheduled engine removals by 3% and maintenance manhours by 6% - \$80.0M LCC savings.
- (U) F101 (B-1): Completed redesign of first stage fan damper and fatigue analysis program to address blade resonant frequency and prevent blade failures - F101 number one safety concern.

2. (U) FY 1993 Planned Program:

- (U) Continue effort to reduce air aborts, aircraft safety incidents, non-mission-capable rates, scheduled and unscheduled engine removals, maintenance man hours, and overall costs.
 - (U) 7909 test hours (6685 sea level, 1137 altitude, 87 flight test) to analyze, verify, and qualify CIP tasks.
 - (U) 667 CIP tasks (247 redesign tasks, 321 repair tasks, 99 analysis tasks) generating a potential \$3.1B LCC savings.
- (U) F100 (F-15/F-16): redesign F100-PW-229 flameholder to improve commonality with all F100 models, reduce spares costs, improve durability - \$53.0M LCC savings.
- (U) F110 (F-16): Redesign #3 bearing to reduce bearing operating temperatures, increase bearing life during oil starvation - \$39.5M LCC savings.
- (U) TF30 (F-111): Redesign first turbine vane cooling cavities to eliminate localized high temperature distress; subsequent 15% reduction in unscheduled engine removals - \$25.0M LCC savings.
- (U) F101 (B-1): Additional Lead-the-Fleet engine analysis and implementation/feasibility studies in support of Lancer 101 activity to address engine failures - F101 #1 safety concern.

3. (U) FY 1994 Planned Program:

- (U) Continue effort to reduce air aborts, aircraft safety incidents, non-mission-capable rates, scheduled and unscheduled engine removals, maintenance man hours, and overall costs.
 - (U) 7744 test hours (6532 sea level, 1212 altitude, 142 flight test) to analyze, verify, and qualify CIP tasks.
 - (U) 637 CIP tasks (237 redesign tasks, 317 repair tasks, 83 analysis tasks) generating a potential \$2.7B LCC savings.

4. (U) Program to Completion:

- (U) Continuing effort to reduce air aborts, aircraft safety incidents, non-mission-capable rates, scheduled and unscheduled engine removals, maintenance man hours, and overall costs.

D. (U) WORK PERFORMED BY: The Subsystem System Program Office (SPO) at Aeronautical Systems Center (ASC), Wright-Patterson AFB OH manages the overall program. Engine CIPs are managed at ASC, and at San Antonio and Oklahoma City Air Logistics Centers. Arnold Engineering Development Center, Tullahoma TN and the Air Force Flight Test Center,

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Program Element: #0604268F

Project Number: N/A

PE Title: Aircraft Engine Component
Improvement Program (CIP)

Budget Activity: #4 - Tactical
Programs

Edwards AFB CA conduct in-house test and evaluation efforts. Contractors (and engines) include Allison Gas Turbine, Indianapolis IN (T56, TF41); General Electric Company, Evendale OH (J79, TF39, F101, F110) and Lynn MA (J85, TF34, T64, T58, T700); Allied Signal (Garrett), Torrance CA and Phoenix AZ (T76, Auxiliary Power Units (APU); Pratt and Whitney, Canada (T400) and West Palm Beach FL (F100, J57, TF30, TF33); Solar Turbine Inc, CA (gas turbine engines); Teledyne, Toledo OH (J69); and Williams International, Walled Lake MI (F107, F112).

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: FY 1992 funding was reduced by a net of \$1.994M by Congressional direction/action and higher priority requirements.

F. (U) PROGRAM DOCUMENTATION: Not Applicable.

G. (U) RELATED ACTIVITIES:

- (U) PE #0603202F (Aircraft Propulsion Subsystem Integration) provides fan and low pressure turbine technology
- (U) PE #0603216F (Aerospace Propulsion and Power Technology) provides engine core (gas generator) technology
- (U) PE #0602203F (Aerospace Propulsion) provides engine component (high pressure compressor, combustor, and high pressure turbine) technology
- (U) PE #0604218F (Engine Model Derivative Program) provides additional component and engine test data
- (U) PE #0708011F (Industrial Preparedness Program) provides materials processing and component fabrication demonstration
- (U) PEs #0604268A/#0604268N (Army/Navy Aircraft Engine CIPs)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

H. (U) OTHER APPROPRIATION FUNDS: Although procurement and O&M appropriations are affected by CIP, such funds do not fall under this program element.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
 PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
1011 JOINT SERVICE ELECTRONIC COMBAT SYSTEMS TESTER (JSECST)	0	0	1,430	28,293	29,723
2066 EF-111A SYSTEM IMPROVEMENT PROGRAM	81,816	57,678	79,005	CONT	TBD
2272 ALE-47 COUNTERMEASURES DISPENSER SYSTEM	3,200	3,774	2,397	0	33,971
2462 COMPASS CALL	31,609	32,521	11,213	CONT	TBD
3108 AIRLIFT DEFENSIVE SYSTEMS	5,500	4,742	192	190	22,749 -
3660 AFECO*	1,126	868	*	*	*
3896 ADVANCED STRATEGIC AND TACTICAL INFRARED EXPENDABLES	8,950	9,388	11,598	22,885	57,214
4076 ON-BOARD ELECTRONIC WARFARE SIMULATOR	1,900	13,656	14,859	43,808	75,223
4077 ADVANCED MISSILE WARNING	5,915	6,770	13,440	CONT	TBD
5618 F-15 PROTECTIVE SYSTEMS	<u>22,012</u>	<u>18,064</u>	<u>9,299</u>	<u>CONT</u>	<u>TBD</u>
Total	162,028	147,461	143,433	CONT	TBD

* AFECO activities conclude after FY93.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element consolidates engineering development efforts related to Air Force Electronic Warfare (EW) requirements. The program objective is to transition advanced development technologies to installed operational capabilities via Engineering and Manufacturing Development (EMD) programs.

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Program Element: #0604270E
PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10 MILLION IN FY 1994:

1. (U) Project 1011. Joint Service Electronic Combat Systems Tester (JSECST):

The JSECST will fill both an Air Force and Navy operational requirement for a small, adaptable, and highly mobile tester capable of verifying the system level performance of installed electronic countermeasures systems. Present maintenance concepts rely on the built-in-test (BIT) capabilities of the line replaceable units (LRUs) to verify system performance. This method fails to detect failures in LRU interfaces and installed aircraft (Group A) hardware. Particular emphasis will be placed on size and weight since the test set must deploy with the operational unit. Failure to fund this effort will result in operational units continuing to rely on the Electronic Warfare Aggressor Squadron to verify the system level performance of installed EC systems.

(U) FY 1992 Accomplishments:

- (U) Not Applicable.

(U) FY 1993 Planned Program:

- (U) Finalize Joint Mission Need Statement (MNS) and Operational Requirements Document (ORD).
- (U) Establish Air Force and Navy program offices.
- (U) Consider acquisition alternatives and strategies including:
 - (U) Modification of the Air Force AN/USM-638 Radio Frequency Transmission Line Test Set (RFTLTS)
 - (U) Modification of the Navy USM-406C test set
 - (U) New System
- (U) Update project cost estimates.

(U) FY 1994 Planned Program:

- (U) Complete concept definition studies and prepare Request For Proposal (RFP) for prototype development.
- (U) Prepare for Engineering and Manufacturing Development (EMD) RFP release. (A new or modified system is necessary to satisfy mission needs identified in Desert Storm.)
- (U) Release RFP for prototypes.

(U) Work Performed By: Air Force Materiel Command, Aeronautical Systems Center, Wright-Patterson AFB, OH, and Naval Air Warfare Center, Aircraft Division, Lakehurst, NJ, will manage the program. The contractor is yet to be determined.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

(U) Procurement (Acft): PE 0207442F

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
3010/BP1200	0	0	0	32,900	32,900

(U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
 PE Title: EW Development

Project : #2066
 Budget Activity: #4 - Tactical Programs

Project Title : EF-111A System Improvement Program

POPULAR NAME : EF-111A SIP

A. (U) SCHEDULE/BUDGET INFORMATION (\$ In Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	None	None	MS III For Band 4 - 2QFY94	MS III For DSS & Exciter - 3QFY96
Engineering Milestones	DSS CDR - Mar 92 Band 4 PDR - May 92 Band 4 CDR - Aug 92	Exciter PDR - Dec 92 DSS A/C Install Feb 93 Exciter CDR - Mar 93	Exciter A/C Install - 3QFY94	DSS & Exciter FCA - 3QFY95 DSS & Exciter PCA - 3QFY96
T&E Milestones	None	TEMP Approval - 3QFY93 DSS CT&E - 4QFY93 Band 4 CT&E - 2QFY93 Band 4 DT&E - 4QFY93	DSS DT&E - 1QFY94 Band 4 IOT&E - 1QFY94	Exciter CT&E - 1QFY95 Exciter DT&E - 2QFY95 DSS & Exciter IOT&E - 3QFY95
Contract Milestones	Exciter EMD CA - Nov 91	None	Band 4 Prod CA - 2QFY94	DSS & Exciter Prod CA - 3QFY96
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	To Complete
Major Contract	73418	49728	70075	Cont
Support Contract	2945	1800	2000	Cont
In-House Support	2029	1950	2400	Cont
GFE/ Other	3424	4200	4530	Cont
Total	81816	57678	79005	Cont

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Program Element: #0604270F
 PE Title: EW Development

Project Number: 2066
 Budget Activity: # 4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The EF-111A System Improvement Program (SIP) project updates the EF-111A Tactical Jamming System (TJS). The update is required to improve the system's availability and keep the system current against the evolving threat. Equipment is becoming difficult to repair and support. In addition, most modern radars use state-of-the-art Electronic Counter-Countermeasure (ECCM) techniques which limit the present jamming system's capability to counter these radars. The SIP will incorporate a new encoder processor, a mil-qualified computer, MIL-STD 1553B data bus, an improved Band 4 transmitter, an upgraded exciter, and software changes. These improvements will improve the system's availability and enable the system to defeat the threat by placing concentrated jamming, with an improved power management system, on specific radars of interest. These improvements will further improve the jammer's capability and improve situational awareness. The program has also studied the integration of narrow-beam antennas, Band 1/2 improvements, and ALR-62I Radar Warning Receiver (RWR) integration.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued Engineering and Manufacturing Development (EMD) of TJS.
- (U) Accomplished Critical Design Review for encoder processor, data bus, and Ada based operational flight program (Digital Subsystem).
- (U) Fabricated System Integration Laboratory (SIL) and began integration and test of Digital Subsystem (DSS) components.
- (U) Completed Band 4 transmitter Preliminary Design Review and Critical Design Review.
- (U) Began Band 4 transmitter prototype fabrication.
- (U) Began Exciter EMD.
- (U) Completed Studies of ALR-62I RWR integration, narrow beam antenna and Band 1/2 directivity.

2. (U) FY 1993 Planned Program:

- (U) Complete fabrication of Digital Subsystem and continue SIL testing.
- (U) Complete Exciter Preliminary Design Review.
- (U) Install Digital Subsystem on aircraft.
- (U) Begin Digital Subsystem CT&E tests.
- (U) Conduct Exciter Critical Design Review and begin fabrication of Exciters.
- (U) Begin SIL integration and test of Exciter components.
- (U) Conduct Band 4 CT&E, DT&E, and trial installation.

3. (U) FY 1994 Planned Program:

- (U) Complete Digital Subsystem CT&E test flights and begin DT&E flight testing.
- (U) Complete fabrication of Exciter.
- (U) Complete SIL integration and test of Exciter.
- (U) Complete aircraft installation and checkout of Exciter.
- (U) Complete Band 4 DT&E and IOT&E.

4. (U) Program to Completion: This is a continuing program.

D. (U) Work Performed By: Sacramento Air Logistics Center, Sacramento, CA is the overall manager of the EF-111A SIP effort, and will directly manage the production and installation of the permanent modification of the EF-111A aircraft. Aeronautical Systems Center, Wright-Patterson AFB, OH, will manage the Digital Subsystem and Exciter development contract. Prime contractor is Grumman

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Program Element: #0604270F
 PE Title: EW Development

Project Number: 2066
 Budget Activity: #4 - Tactical Programs

Aerospace Corp, Bethpage, NY. The Band 4 transmitter upgrade will be managed by Warner-Robins Air Logistics Center, Robins AFB, GA. Prime contractor for Band 4 transmitter is Motorola Corp, Scottsdale, AZ.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Exciter PDR/CDR dates slipped 3 months with no impact to overall schedule. Band 4 IOT&E slipped 1 month due to vendor procurement problem.
3. (U) COST CHANGES: FY 92 funding increased to cover higher overhead rates incurred by contractors.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAC SON 319-88, (S) dated 23 Oct 89
- (U) TAC SON 337-88, (S) dated 15 Sep 89
- (U) TAF SORD 319-88-I/II-A (Revision 1), (S-NF-WN-NC) dated 20 Jun 91

G. (U) RELATED ACTIVITIES:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To Complete</u>
PE 27252F	0	0	15.0	Cont

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
None		

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Date</u>	<u>Remarks</u>
TEMP approval	3QFY93	None
Band 4 CT&E	2QFY93	None
Band 4 DT&E	4QFY93	None
DSS CT&E	4QFY93	None
Band 4 IOT&E	1QFY94	None
DSS DT&E	1QFY94	None
Exciter CT&E	1QFY95	None
Exciter DT&E	2QFY95	None
DSS & Exciter IOT&E	3QFY95	None

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YEAR 1994 BUDGET ESTIMATE SUBMISSION APRIL 1993
DESCRIPTIVE SUMMARIES(U) DEPARTMENT OF THE AIR FORCE
WASHINGTON DC APR 93 XC-USAF

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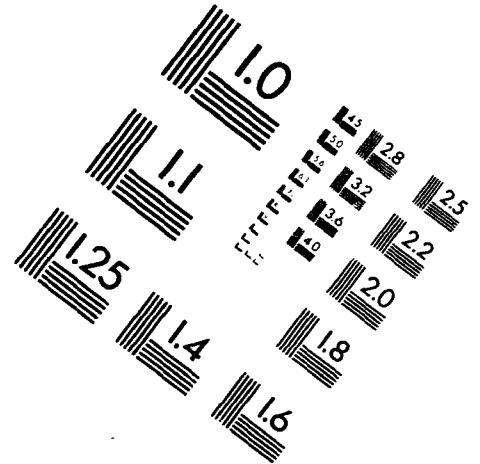
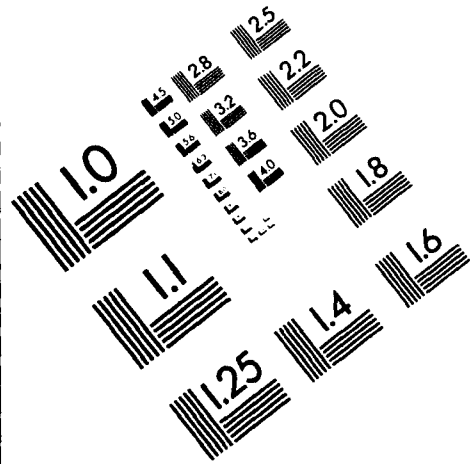


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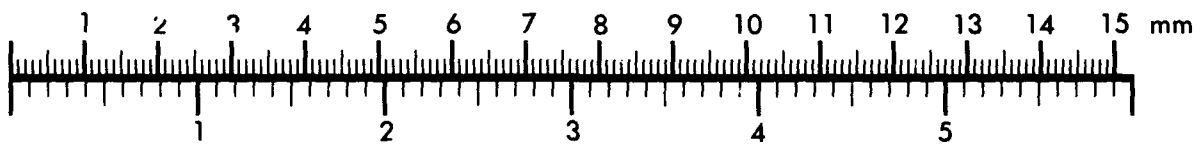
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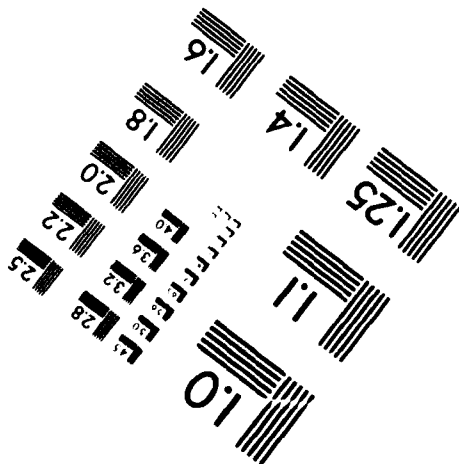
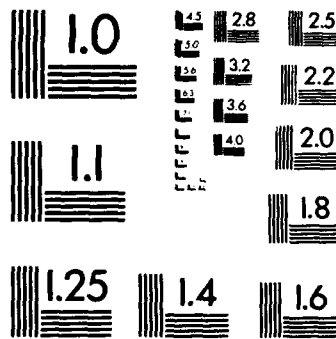
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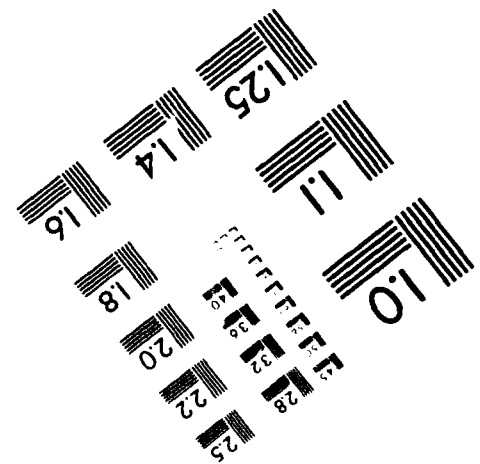
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Program Element: #0604270F
PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

2. (U) Project 2272, ALE-47 Countermeasures Dispenser System (CMDS):

This project develops the ALE-47 CMDS system for F-16 Block 40 and 50 retrofit installations. The ALE-47 CMDS is a joint Air Force (lead), Navy, and Army program to develop an interactive, programmable expendables dispenser for the F-16 and numerous Navy & Army aircraft. The ALE-47 provides manual, semi-automatic, and automatic dispensing of expendables. The semi-automatic and automatic modes use radar warning receiver (RWR) information, along with aircraft position and speed to optimize the number, type, quantity, and speed of the dispense. The ALE-47 allows use of multiple expendable types, increases number of manual programs, has faster dispense rates, and has growth provisions for a missile warning system.

(U) FY 1992 Accomplishments:

- (U) Completed Development Test and Evaluation (DT&E).
- (U) Began Initial Operational Test and Evaluation (IOT&E).
- (U) Began depot support development.
- (U) Awarded long lead contract for production.

(U) FY 1993 Planned Program:

- (U) Complete IOT&E.
- (U) Make Lot I production decision.
- (U) Continue depot support development.

(U) FY 1994 Planned Program:

- (U) Complete depot support development.
- (U) Begin retrofit into the F-16 C/D Block 40 aircraft.

(U) Work Performed By: Air Force Materiel Command, Aeronautical Systems Center, Wright-Patterson AFB, OH, will manage the program. Tracor, Austin, TX, has a firm fixed price contract to accomplish the ALE-47 CMDS EMD and two fixed price incentive fee options.

(U) Related Activities:

- (U) PE 0207133F, F-16 Squadrons.
- (U) PE 0604270N, project number W0638, Electronic Warfare Development.
- (U) There is no unnecessary duplication of this effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

(U) Procurement (Acft): PE 0207133F

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
F-16	4.6	0	2.5	0	14.8
F-16 Mods	11.9	14.9	11.8	73.9	112.5

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
 PE Title: Electronic Warfare Development

Project Number: 2462
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
COMPASS CALL	31,609	32,521	11,213	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

COMPASS CALL is an EC-130H stand-off jamming platform used to disrupt enemy air defenses and ground operations.

The EC-130H complements both present and future air, ground and sea based systems to provide the theater commanders with a coordinated jamming capability. This program element provides a continuing technology program to keep the EC-130H current with the rapidly evolving threat.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments:

- (U) Awarded contract incorporating the Low-Band subsystem.
- (U) Continued the upgrades to the jamming waveform algorithms.
- (U) Continued integration of the High Band subsystem.
- (U) Continued Engineering and Manufacturing Development (EMD) of
- (U) Awarded EMD contract to.
- (U) Began Mission Simulator Mission Generation System Improvements.

2. (U) FY 1993 Planned Program:

- (U) Continue the upgrades to the jamming waveform algorithms.
- (U) Test and evaluate the new jamming waveforms that have been added to the jam exciter.
- (U) Complete high-band system integration in the system support facility.
- (U) Continue aircraft integration and preparation for flight test.
- (U) Continue development of
- (U) Conduct flight tests of Low-Band system improvements.
- (U) Continue development of
- (U) Begin development of

3. (U) FY 1994 Planned Program:

- (U) Program is focused into
-
-
-
- (U) The above capabilities are being provided through the following activities:
 - (U) Continue upgrades to the waveform algorithms allowing reprogramming the software against new threats.
 - (U) Integrate High-Band system into aircraft platform and perform DT&E.
 - (U) Complete, accept, and receive contract deliverables from the High-Band system EMD contract.

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Project Number: 2462
Budget Activity: #4 - Tactical Programs

- (U) Test prototype of
- (U) Integrate and flight test
- (U) Complete, accept and receive contract deliverables from the contract.
- (U) Continue development of

4.(U) Program to Completion:

- (U) This is a continuing program since the platform must stay current with the rapidly evolving threat.
- (U) Items remaining to be completed are software upgrades to increase

D. (U) Work Performed By: Air Force Material Command, Wright-Patterson AFB, OH, manages the program to develop improvements and modifications to the COMPASS CALL program. The primary contractors include: Lockheed Aircraft Service Company, Ontario, CA; Sanders Associates, Nashua, NH; Magnavox, Ft Wayne, IN; and GTE, Mountain View, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Some planned efforts, to include the low/mid/high band program, from FY 92 and beyond are not shown due to the cancellation of Block 4 upgrades.
2. (U) SCHEDULE CHANGES: Block III upgrades are on schedule.
3. (U) COST CHANGES: FY 92 and 93 funding is decreased by program share of Congressional reductions (SBIR, inflation, etc.).

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF 318-88-I/II/III-A (Revision 1), System Operational Requirements Document (SORD) for Counter Command, Control, and Communications (Counter C3) in Support of Defense Suppression, 02 Jan 92.

G. (U) RELATED ACTIVITIES:

- (U) PE 02072530, COMPASS CALL procures the system hardware.
- (U) Cooperation with the Army's PEO for Signal Warfare provides for technology transfer and prevents duplicative R&D efforts.
- (U) Member of a to facilitate technology transfer within DOD.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

- (U) Aircraft Procurement (3010):

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	33,500	83,681	77,254	Cont	TBD

- (U) Military Construction (3300): None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Project Number: 2462
Budget Activity: #4 - Tactical Programs

J. (U) MILESTONE SCHEDULE:

- | | | |
|---|--------------|----------|
| 1. (U) Awarded contract to provide | capability | Jun 1991 |
| 2. (U) Awarded contract to design and test | | Dec 1991 |
| 3. (U) Contracted for demonstration and integration of High-Band system | | Dec 1991 |
| 4. (U) Conducted Critical Design Review (CDR) of High-Band system | | Feb 1992 |
| 5. (U) Conducted CDR of | program | Jun 1992 |
| 6. (U) Conducted Preliminary Design Review of | Program | Feb 1993 |
| 7. (U) Award contract to provide | improvements | Jun 1993 |
| 8. (U) Conduct CDR of | | Aug 1993 |
| 9. (U) Conduct High-Band integration in the system integration facility | | Dec 1993 |
| 10. (U) Complete High-Band System software test and integration | | Dec 1994 |
| 11. (U) Acceptance testing on | software | Dec 1994 |
| 12. (U) Complete | | Jan 1995 |
| 13. (U) Complete | | Jun 1995 |

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

3. (U) Project 3108, Airlift Defensive Systems: This project provides for the development and prototype of a common defensive system (AAR-47 Missile Warning Receiver, ALE-40 or 47 Countermeasures Dispenser) for tactical and strategic aircraft, especially the C-130, C-141 and C-5. This is a design-to-cost effort, utilizing to the maximum extent possible the engineering efforts of Project Snowstorm. Concepts will be explored for defensive systems against advanced infrared countermeasures (IRCM) for all AMC aircraft.

(U) FY 1992 Accomplishments:

- (U) Completed Flight test of C-141 Snowstorm prototype chaff/flare
- (U) Started C-130 modification as AFRES ADS contract option
- (U) Defined needs and continued plans to include AFRES and NGB aircraft in ADS program
- (U) Began C-141 simulator modification
- (U) Continued OT&E of Snowstorm aircraft
- (U) Began trial installations of ALE-47 on C-130, C-141, and C-5 aircraft

(U) FY 1993 Planned Program:

- (J) Increase AAR-47 processor memory
- (U) Complete design review of C-141 and begin procurement process
- (U) Complete design review of C-5
- (U) Begin kitproof and installation of C-141
- (U) ALM-262A Countermeasures Test Set Upgrade
- (U) Evaluate ALE-47 trial installations/incorporate necessary engineering changes in the aircraft
- (U) Begin procuring ALE-47 for ADS aircraft
- (U) Define needs for advanced IRCM

(U) FY 1994 Planned Program:

- (U) Evaluate AAR-47 changes
- (U) Evaluate AAR-47 installation
- (U) Begin kitproof and installation of C-5
- (U) Define needs for advanced IRCM

- (U) Work Performed By: The current Airlift Defensive Systems (ADS) Program Manager is the Air Force Materiel Command, Wright-Patterson AFB, OH. Based on the IWSM Plan, in FY 93 the management will be split to the respective aircraft system program directors. The C-130 AFRES ADS Group A prime contractor is Aero Systems, Memphis, TN. C-130 contract installation teams are from Lockheed Support Systems. Options on these contracts will be exercised for AMC and NGB ADS requirements. Group A and installation contracts for both C-141 and C-5 will be competed with options for AFRES/NGB requirements.

(U) Related Activities:

- (U) PE-0401330F/0604231F, C-17 Program
- (U) PE-0401115F, C-130 Airlift Squadrons
- (U) PE-0401118F, C-141 Airlift Squadrons
- (U) PE-0401119F, C-5 Airlift Squadrons
- (U) PE-0404011F, Special Operations Forces
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

(U) Other Appropriation Funds (\$ In Thousands):

Program Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Aircraft Procurement (BA 5, BP 1100 Aircraft Modification):					
3010 Airlift Defensive Systems	8,300	14,300	12,800	47,400	82,800

- (U) Internal Cooperative Agreements: Not Applicable.

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

4. (U) Project 3660, Air Force Electronic Combat Office (AFECO):

The purpose of the Air Force Electronic Combat Office is to focus USAF electronic combat acquisition and upgrade programs; integrate the planning, development, production, life cycle support, and modification of USAF EC systems and to ensure the EC programs are technically and fiscally executable to meet the user's needs and support implementation of the EC Test Process.

(U) FY 1992 Accomplishments:

- (U) Continued support to EC program offices, to users in developing EC requirements, and to joint service organizations/working groups.
- (U) Continued EC Test Process training, development of EC Test Handbooks and EC Test Managers Handbooks. These efforts transferred to AFDTC/XRE in June, 1992.
- (U) EW Database maintenance, support, and growth.
- (U) Supported and distributed Common EC Computer Simulation Architecture.
- (U) Studies and analyses related to and required for:
 - (U) SOF EC Requirements Roadmap
 - (U) C-17 Missile Warning System Sensor Optimization Study
 - (U) High Power Countermeasures Mission/Requirements Analysis
 - (U) EC Planning Guide for Air Combat Command (ACC)
 - (U) B-1B ECM Requirements Analysis
- (U) Worked with Wright Lab to develop forum to better support the EW Industry's IR&D.

(U) FY 1993 Planned Program:

- (U) Continue support to EC program offices, and to users in developing EC requirements.
- (U) EW Database implementation, review, and upgrade.
- (U) Support the J-MASS Architecture for all EC modeling.
- (U) Studies and analysis for:
 - (U) SOF/Airlift Defensive Systems
 - (U) Tactical Systems
 - (U) Update of EC Planning Guide for ACC
 - (U) B-1B Roadmap
 - (U) Millimeter Wave studies
- (U) Expand efforts with Wright Lab and industry to support EW IR&D.

(U) FY 1994 Planned Program:

- (U) Not applicable. Program terminates after FY93.

(U) Work Performed By: Air Force Materiel Command, Aeronautical Systems Center, Wright-Patterson AFB, OH, manages the program.

(U) Related Activities:

- (U) AFECO works closely with the Joint Commonality Group for Electronic Warfare to coordinate the exchange of information among related technologies, development, acquisition, and modification offices to ensure minimal duplication of function.
- (U) There is no unnecessary duplication of this effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY (U)

Program Element: #0604270F
PE Title: Electronic Warfare Development

Project Number: 3896
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
Advanced Strategic and Tactical Infrared Expendables (ASTE)	8,950	9,388	11,598	22,885	57,214

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program develops and fields a family of advanced infrared (IR) expendable decoy countermeasures (CM) to provide combat, mobility and special operations aircraft increased survivability against the modern IR missile threat. These new IR countermeasures (IRCM) will be designed to provide increased effectiveness against current and advanced IR guided missiles, with emphasis on threats with embedded IR counter-countermeasures (IRCCM) that can defeat existing IR decoys. Acquisition strategy is to execute a demonstration and validation (Dem/Val) program to:

1) determine the viability of promising countermeasures techniques by evaluating a variety of prototype expendables, and 2) gauge the capability of the technology base to support near-term solutions. The program will also develop and use an advanced IR modeling & simulation system and emulation-level threat models to examine specific countermeasure techniques and evaluate performance specifications needed to protect user-identified operational platforms. The Engineering and Manufacturing Development (EMD) phase, beginning in FY 94, will build upon the best candidate technologies examined during Dem/Val. Objective is to field new expendables in FY 96.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Conducted ground-based radiometric and ejection testing of prototype expendables
- (U) Conducted dynamic radiometric and trajectory testing of prototypes
- (U) Conducted successful System Requirements Review
- (U) Conducted successful System Safety Reviews with all five contractors
- (U) Awarded last of five Dem/Val contracts
- (U) Contractors actively designing, fabricating and conducting in-house testing of prototypes
- (U) Completed initial static testing of all prototype flares at Naval Surface Warfare Center (NSWC), Crane Division
- (U) Commenced preparation for EMD solicitation and FY 94 EMD start
- (U) Completed initial flight testing of all fighter and airlift sized decoys
- (U) Continued to monitor other advanced IRCM development efforts for possible injection of related technologies into the ASTE EMD program
- (U) Continued development effort on digital models of selected IR seekers and on ASTE-unique modeling system.
- (U) Integrated threat models into ASTE-unique modeling system

2. (U) FY 1993 Planned Program:

- (U) Successfully developed and began fabrication of prototype decoy designs
- (U) Completed sled testing of bomber decoy
- (U) Developed and signed a memorandum of agreement with the Navy for joint development of a kinematic flare, based on technology developed during the Navy MJU-29 program

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Project Number: 3896
Budget Activity: #4 - Tactical Programs

- (U) Complete countermeasures effectiveness flight testing; began 1 Feb 93 at Eglin AFB, FL
 - (U) Correlate digital seeker models with data from flight testing and hardware-in-the-loop testing
 - (U) Assess flight test results
 - (U) Conduct assessment of decoy specifications for platforms identified in users' Operational Requirements Document (ORD)
 - (U) Conduct Cost and Operational Effectiveness Assessment to support EMD milestone decision
 - (U) Plan strategy for FY 94 EMD start
 - (U) Release draft EMD RFP
 - (U) Conduct live fire testing at White Sands Range, NM
3. (U) FY 1994 Planned Program:
- (U) Release EMD RFP for advanced decoys
 - (U) Conduct EMD source selection and award contract by second quarter FY 94
 - (U) Initiate DT&E testing of advanced decoys
 - (U) Plan IOT&E with AFOTEC
 - (U) Continue engagement modeling and analysis to support EMD and to examine potential effectiveness of concepts against advanced threats
 - (U) Continue to monitor advanced development efforts at Wright Laboratory for possible pre-planned improvement of ASTE concepts.
4. (U) Program to Completion:
- (U) Complete EMD, DT&E, IOT&E and first article acceptance testing.
 - (U) Initiate Low Rate Initial Production. (LRIP)
 - (U) Meet Required Assets Available (RAA) for first priority platform in FY 96
 - (U) Enter full rate production in FY 96
- D. (U) Work Performed By: Air Force Materiel Command, Aeronautical Systems Center, Electronic Combat SPO, Wright Patterson AFB, OH, has overall program management responsibility; Electronic Warfare Division, Avionics Laboratory, Wright Labs provides technical expertise on development of the IR Modeling and Analysis Tools and related advanced IRCM projects. Naval Surface Warfare Center, Crane, IN, is supporting advanced development of prototype designs and providing technical assistance during Technology Demonstration ground and flight testing. There are five Dem/Val contractors providing prototypes for testing and conducting advanced development projects. They are Tracor Aerospace, San Ramon, CA; Thiokol Corp, Brigham City, UT; Lockheed Sanders, Inc, Nashua, NH; Alloy Surfaces Co, Wilmington, DE; and Loral EOS, Inc, Pasadena, CA.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: None.
 2. (U) SCHEDULE CHANGES: None.
 3. (U) COST CHANGES: None.
- F. (U) PROGRAM DOCUMENTATION:
- (U) TAF 323-88, SON for Advanced Infrared Countermeasure for TAF Aircraft, 6 Sep 89 (S/NF)
 - (U) AFSOC MNS 001-91, Improved Infrared Countermeasures, 21 Aug 91 (S/NF)
 - (U) Multi-Command ORD (ACC, AMC, AFSOC) (draft) received 8 Feb 93

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Project Number: 3896
Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:

- (U) PE 0604226F, B-1B Conventional Upgrade Program
- (U) PE 0603270F, Electronic Combat Technology
- (U) PE 0603270N, Electronic Combat Technology
- (U) Joint Coordinating Group (JCG)-Electronic Warfare and JCG-Aircraft Survivability are coordinating efforts on advanced IRCM and threat exploitation
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Program Office has initiated dialogue with the Royal Air Force, which is conducting a similar advanced decoy program. No formal relationship exists at this time. The Program Office also remains cognizant of technology cooperative efforts conducted under several international working groups.

J. (U) MILESTONE SCHEDULE:

- | | |
|--|----------------|
| 1. (U) Milestone II | September 1993 |
| 2. (U) EMD Phase | FY 94 - FY 96 |
| 3. (U) Production Deliveries (first priority decoys) | Early 1996 |

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
 PE Title: Electronic Warfare Development

Project Number: 4076
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
On-Board Electronic Warfare Simulator	1,900	13,656	14,859	43,808	75,223

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project develops the On-Board Electronic Warfare Simulator (OBEWS). OBEWS will provide on-board electronic warfare (EW) continuation training for F-16 and F-15E pilots by supplementing or completely simulating their outside radar signal environment with digital signals. Combat Air Force pilots receive comprehensive training on electronic combat (EC) ranges once every 1-2 years. To complement this training, OBEWS will provide needed continuation training at their home bases. An OBEWS proof-of-concept prototype was developed and flight tested at Eglin AFB in 1989 to evaluate the operational effectiveness and suitability of OBEWS as an EC training device. The prototype consisted of a pod-mounted system interfaced through the F-16's ALR-69 radar warning receiver (RWR). The follow-on Engineering and Manufacturing Development (EMD) system will be internally mounted and work through each platform's radar warning receiver (RWR). For the F-16, ALR-56M and ALR-69 RWR equipped aircraft will be installed with OBEWS. For the F-15E, OBEWS will work through the ALR-56C RWR. Software developed under the OBEWS prototype contract will be supplied as government furnished media to the EMD contractor(s). OBEWS mission planning and debriefing will be accomplished on the Air Force Mission Support System (AFMSS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments:

- (U) Released Request for Proposal (RFP) for OBEWS EMD in April 1992.
- (U) Began planning for OBEWS integration into F-16C/D and F-15E aircraft.
- (U) Awarded EMD contract with production options in Sept 1992.

2. (U) FY 1993 Planned Program:

- (U) Continue OBEWS EMD.
- (U) Begin OBEWS integration into F-16C/D aircraft.
- (U) Continue planning for OBEWS integration into F-15E aircraft.

3. (U) FY 1994 Planned Program:

- (U) Conduct Critical Design Review (CDR).
- (U) Complete development and fabrication of on-board subsystem hardware.
- (U) Complete development and coding of on-board subsystem, mission planning function, and mission debriefing function software.
- (U) Start factory testing of hardware and software.

4. (U) Program to Completion:

- (U) Start and complete DT&E at Eglin AFB, FL.
- (U) Start and complete IOT&E at Mt. Home AFB.
- (U) Complete F-16 Block 30 integration testing.
- (U) Complete F-15E integration testing.
- (U) Exercise the OBEWS production option(s).
- (U) Study OBEWS integration into other aircraft.

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Program Element: #0604270E
PE Title: Electronic Warfare Development

Project Number: 4076
Budget Activity: #4 - Tactical Programs

D (U) Work Performed By: The program is managed by the Range Systems System Program Office, Aeronautical Systems Center (AS/JO) at Eglin AFB, FL. Lockheed Sanders Inc., Nashua, NH, has a Cost Plus Incentive Fee contract to accomplish OBEWS EMD with two Firm Fixed Price production options.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: OBEWS production funds were slipped from FY95 to FY97 to manage the aircraft modification account ramp and execution. The development and operational flight test schedules were lengthened to more conservative time frames. (See Milestone Schedule items 6.-9.)
3. (U) COST CHANGES: Due to an anticipated integration cost increase on the F-16 Block 30, the overall program budget has been increased from \$62.0M to \$78.8M.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 317-88, OBEWS, 26 May 89.
- (U) CAF SORD 317-88-II-A, On-Board Electronic Warfare Simulator (OBEWS), 6 Jul 92.

G. (U) RELATED ACTIVITIES:

- (U) PE 0207133F, F-16 Squadrons.
- (U) PE 0207134F, F-15E Squadrons.
- (U) PE 0208006F, Mission Planning Systems.
- (U) PE 0207597F, Training - Tactical Air Force.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

(U) AIRCRAFT PROC (BSA 0505/OTHACF)

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
3010/BP1100	0	0	0	46,400	46,400

(U) Military Construction: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

- | | | |
|--|-------|------|
| 1. (U) OBEWS Prototype DT&E Test Report - Complete | Sep | 1989 |
| 2. (U) OBEWS Prototype IOT&E Test Report - Complete | Dec | 1989 |
| 3. (U) EMD RFP Release - Complete | Apr | 1992 |
| 4. (U) EMD Contract Award - Complete | Sep | 1992 |
| 5. (U) CDR | 1 Qtr | 1994 |
| 6. (U) DT&E on F-16 C/D Complete *(1Q 95) | 1 Qtr | 1996 |
| 7. (U) IOT&E on F-16 C/D Complete (including test report) *(4Q 95) | 4 Qtr | 1996 |
| 8. (U) Production Decision for F-16 C/D Blk 40 *(4Q 95) | 4 Qtr | 1996 |
| 9. (U) IOC on F-16 C/D *(3Q 96) | 2 Qtr | 1998 |

*Original scheduled dates. See E.2. (schedule changes).

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
 PE Title: EW Development

Project Number: 4077
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)Project Title

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Advanced Missile Warning	5,915	6,770	13,440	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Missile warning systems are required to effectively reduce combat aircraft attrition within mission areas that contain threats of increasing complexity and numbers. This project will integrate missile warning system (MWS) for current generation Air Force and Navy fighter aircraft. Missile warning for next generation aircraft, (F-22 and A/F-X), is funded in the F-22 development program. Pre-Engineering and Manufacturing Development (EMD) activities will focus on integration and demonstration of mature technologies and non-developmental systems (passive and active) to meet operational requirements for missile warning to counter the post-2000 year missile threat. Without this system, survivability of current generation tactical fighter aircraft will decrease due to improvements in threat missile systems, i.e., advanced electro-optics, infrared and radio frequency missile seekers, and the proliferation of existing threat systems. Internal installation is planned for the F-16, F-15, F-14, and F-18. An Electronic Countermeasures (ECM) pod mechanization system is a candidate for F-111 and A-10 aircraft and any aircraft capable of carrying the ECM pod. Missile warning for the A-6 and AV-8B is funded in PE 64270N and PE 64214N respectively.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments:

- (U) Completed studies and began ECM pod integration demonstration.
- (U) Demonstrated missile warning system effectiveness on fighter aircraft
- (U) Completed plume analysis risk reduction task for F-15 and F-16.
- (U) Began modeling/simulation effort for Cost and Operational Effectiveness Analysis (COEA).

2. (U) FY 1993 Planned Program:

- (U) Complete Cost and Operational Effectiveness Analysis (COEA).
- (U) ECM/Missile Warning pod mechanization program:
 - (U) Complete cost, schedule, risk, and performance analysis of ECM pod modification.
 - (U) Demonstrate integration of existing MWS's into the ALQ-131 & ALQ-184 ECM pods.
 - (U) Start flight certification of modified pods.

3. (U) FY 1994 Planned Program:

- (U) ECM/Missile Warning pod mechanization program:
 - (U) Conduct hot bench system integration.
 - (U) Complete flight demonstrations.
 - (U) Prepare Milestone II documentation.
 - (U) Complete EMD (Milestone II) decision preparation.
 - (U) Prepare for EMD phase.
- (U) Internal Missile Warning program:
 - (U) Conduct aircraft integration analysis and begin design for passive and active sensor technology.
 - (U) Demonstrate feasibility of internal integration for F-15, F-16.
 - (U) Conduct hot bench testing of integrated systems.

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Program Element: #0604270E
PE Title: EW Development

Project Number: 4077
Budget Activity: #4 - Tactical Programs

4. (U) Program to Completion: This is a continuing program.

D. (U) Work Performed By: Air Force Material Command, Aeronautical Systems Center, Wright-Patterson AFB, OH. Electronic Warfare Directorate, Warner-Robins AFB, Ga. Major contractors in pre-EMD efforts are Sanders, Nashua NH, Loral Infrared & Imaging Systems, Lexington, MA, Cincinnati Electronics, Cincinnati, OH, Raytheon Electromagnetic Systems Division, Goleta, CA, Westinghouse Electronic Systems Group, Baltimore, MD, General Dynamics Fort Worth Division, Fort Worth, TX, and McDonnell Douglas Aircraft Division, St. Louis, MO. The missile warning system EMD contractor is still to be determined.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: OSD withhold of funds in FY92 and FY93 will delay EMD contract award 18 months for the internal configuration and six months for the pod configuration.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 316-88, Missile Warning System, 6 Sep 89 (S).
- (U) TAF SORD 316-88-I-A, Missile Warning System on Existing TAF Aircraft, 5 Nov 91, (S/NF).

G. (U) RELATED ACTIVITIES:

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

- | | |
|--|---------|
| 1. (U) Complete flight demonstrations of ECM pods | FY 4/94 |
| 2. (U) EMD decision (Milestone II) for ECM pod | FY 1/95 |
| 3. (U) EMD contract award for ECM pod | FY 3/95 |
| 4. (U) EMD decision (Milestone II) for internal system | FY 2/96 |
| 5. (U) EMD contract award for internal installation | FY 4/96 |

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

5. (U) Project 5618, F-15 Protective Systems:

This project develops the Tactical Electronic Warfare System (TEWS) improvements and upgrades to the F-15 self-protection suite. The F-15 TEWS consists of the ALR-56C Radar Warning Receiver (RWR), the ALQ-135 Internal Countermeasures System (ICS), the ALQ-128 Electronic Warfare Warning System, and the ALE-45 Countermeasures Dispenser (CMD). Hardware development of the ALR-56C, ALQ-135 Band 3, ALE-45, and ALQ-128 is complete with initial software loads tested and fielded.

(U) FY 1992 Accomplishments:

- (U) Conducted TEWS Threat Studies.
- (U) Completed F-15E ALR-56C Phase II developmental testing.
- (U) Continued development testing to support TEWS Integration and Radio Frequency Compatibility Programs.
- (U) Completed development of Preflight Message Generator.
- (U) Completed ALR-56C software threat updates.

(U) FY 1993 Planned Program:

- (U) Conduct F-15C/E ALR-56C/ALQ-135 Phase II Operational testing.
- (U) Continue threat studies to include combined countermeasures.
- (U) Begin refurbishment of ALR-56C test assets for return to operational inventory.
- (U) Deliver TEWS integrated baseline software to F-15C/Es.
- (U) Continue ALR-56C software threat updates, especially APG-70 type radars.

(U) FY 1994 Planned Program:

- (U) Improve integration of TEWS with aircraft avionics and fire control radar.
- (U) Complete TEWS displays improvements.
- (U) Accomplish integrated TEWS software update and testing.
- (U) Continue ALR-56C threat updates.
- (U) Complete refurbishment of ALR-56C test assets.
- (U) Continue development and testing of ALQ-135 improvements.

- (U) Work Performed By: Air Force Materiel Command, Aeronautical Systems Center, F-15 Program Office, Wright-Patterson, AFB, OH, is the system integrator. Loral, Yonkers, NY, is the prime for the ALR-56C. Northrop, Rolling Meadows, IL, is the prime for the ALQ-135. Tracor, Austin, TX, is the prime for the ALE-45.

(U) Related Activities:

- (U) PE 0207134F, F-15E Squadrons.
- (U) PE 0207130F, F-15C Squadrons.
- (U) There is no unnecessary duplication of this effort within the Air Force or the Department of Defense.

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Program Element: #0604270F
PE Title: Electronic Warfare Development

Budget Activity: #4 - Tactical Programs

(U) Other Appropriation Funds (\$ In Thousands):

(U) Aircraft Procurement (BSA 0502/F01500)

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
ALQ-135	142,100	152,400	158,100	281,500	1,374,216
Qty	60	60	60	104	514
ALR-56C	38,000	46,300	31,900	0	540,208
Qty	35	40	29	0	595
ALE-45	3,900	23,600	8,700	0	89,200
Qty	(Supt Equip)	121	44	0	524

(U) Military Construction : Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321F

Budget Activity: #4 - Tactical Programs

PE Title: Tactical Fusion Program

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Tactical Fusion Program (JTFP)	4,922	2,883	4,221	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Joint Tactical Fusion Program was a joint Army/Air Force effort to develop a near-real-time (NRT), all-source, tactical intelligence fusion and processing/dissemination system. The joint program office was disestablished in Dec 90 and the Air Force is proceeding with the development of an Intelligence Correlation Module (ICM), which was formerly called the Tactical Air Force (TAF) Linked Operations/Intelligence Centers - Europe (LOCE) Capability (TAFLC). The air combat forces have a need to rapidly (on a NRT basis) exploit time-sensitive and high volume multi-sensor information. The ICM will be fielded at the Combat Air Forces Air Operations Centers (AOCs) to support Air Tasking Order (ATO) generation. The ICM will interface with the unit level intelligence system, Sentinel Byte, and force level intelligence systems. In an effort to meet Theater Battle Management goals (specifically, provide a correlated intelligence display of enemy activity to support the planning and execution of the battle), this program element funds the development of software into an open system standard architecture, hosting the software in the ACC Contingency Theater Automated Planning System (CTAPS), and development of an SCI-level capability for ACC, USAFE and PACAF. ICM will be used to support theater missile defense beginning in FY 1994.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Tactical Fusion Program:

(U) FY 1992 Accomplishments:

- (U) Began development of Phase I implementation CTAPS ICM, including correlation processor, message handler, and database software modifications to open system standards.

(U) FY 1993 Planned Program:

- (U) Complete Phase I CTAPS implementation and software development.
- (U) Begin implementation of USAFE/PACAF collateral ICM in conjunction with Intelligence Data Handling Systems (IDHS) developments and CTAPS deployments.

(U) FY 1994 Planned Program:

- (U) Begin to integrate system with IDHS upgrades, including collection management, imagery, common mapping system, and battle damage assessment capabilities.
- (U) Begin developing SCI-level correlation capability.
- (U) Begin to integrate other theater intelligence feeds to ICM.
- (U) Begin development of the Intelligence Support Plan to document the intelligence support required to effectively conduct Theater Missile Defense operations. This effort will include the development of a roadmap to integrate intelligence capabilities within the AF battle management architecture.

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Program Element: #0604321F
PE Title: Tactical Fusion Program

Budget Activity: #4 - Tactical Programs

- (U) Work Performed By: AFMC/Electronic Systems Center is the Air Force in-house developing organization. Contractors are BTG Corporation, Vienna, VA, and PRC Corporation, Omaha, NB.
- (U) Related Activities:
 - (U) Program Element #0603260F, Intelligence Advanced Development.
 - (U) Program Element #0207431F, Tactical Air Intelligence Systems.
 - (U) Program Element #0604321A, Army Joint Tactical Fusion Program.
 - (U) Program Element #0207438F, Theater Battle Management C4I (TBM C4I).
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604408F
PE Title: National Launch System

Project Number: 3941
Budget Activity: #6 - Defense Wide Mission Support

A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
3941 SpaceLift	48,673	9,435	53,906	Cont.	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Numerous studies by DoD and independent groups have confirmed the need for a new spacelift system with lower costs, higher reliabilities, and greater operability than current systems. When Congress directed the cancellation of the National Launch System (NLS) program as part of the FY 93 appropriation conference report language, the Air Force sought other ways of meeting the requirement. The Air Force is convinced that a lower cost, more reliable, and more operable spacelift system is needed by DoD, civil, and commercial space programs. The effort described will explore different concepts to determine the best approach to meet future spacelift needs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Completed and demonstrated propulsion technologies relating to the development of the Space Transportation Main Engine (STME). Examples:
 - (U) Prototyped STME manufacturing processes
 - (U) Test fired a sub scale rocket engine injector.
 - (U) Electromechanical actuator and control valve engineering tests.
- (U) Completed and demonstrated the key system design technologies:
 - (U) Multi-path redundant avionics architecture and software.
 - (U) Light Detection and Ranging (LIDAR) wind profiler for adaptive guidance and navigation.

2. (U) FY 1993 Program:

- (U) Perform a requirements review to define most current operational requirements and recommended acquisition approach.
- (U) Terminate National Launch System Program.

3. (U) FY 1994 Planned Program:

- (U) Conduct Concept studies with multiple contractors (approximately five @ \$7M each).
- (U) Investigate alternative propulsion technologies.
- (U) Conduct demonstrations to aid in defining concepts, feasibilities, and risks (approximately five @ \$2M each).
- (U) Conduct Cost and Operational Effectiveness Analyses

4. (U) Program to Completion:

- (U) Milestone I decision in FY 95 to FY 96
- (U) If Milestone I decision is to develop a new system, enter Demonstration/Validation phase.
- (U) First launch circa FY 2004 .

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Program Element: #0604408F

Project Number: 3941

PE Title: SpaceLift

Budget Activity: #6 - Defense Wide Mission Support

- D. (U) Work Performed By: The responsible AF agency is AF Materiel Command's Space and Missile Center, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA and TRW, San Bernardino, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The SpaceLift effort will explore all viable concepts, rather than only low risk efforts as NLS and ALS did.
2. (U) SCHEDULE CHANGES: The reduced funding provided by Congress in FY 1993 has resulted in a need to substantially revise the program schedule.
3. (U) COST CHANGES: Total development funding has been reduced to reflect the Congressional direction and change in program direction.

F. (U) PROGRAM DOCUMENTATION:

- (U) National Space Policy Directive-4, 1991.
- (U) AFSPACECOM SORD 005-88-1 for a Military Advanced Launch System (ALS), 14 Aug 1990.
- (U) AFSPACECOM SON 005-88 for an ALS, 12 Aug 1988.
- (U) Mission Need Statement for an ALS, 30 Jun 1988.

G. (U) RELATED ACTIVITIES:

- (U) There is no unnecessary duplication of effort within the AF, DoD, or NASA.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) Initiate Concept Exploration studies 2Q 1994
2. (U) DAB decision Milestone 1 1995 to 1996
3. (U) Subsequent milestones will depend on the outcome of the Milestone I DAB decision.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604601F
 PE Title: Nuclear, Biological
 and Chemical Defense
 Equipment

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3321 Chemical and Biological Agent Detection and Warning	1,410	3,170	2,013	Cont	TBD
3337 Individual Protection	<u>7,904</u>	<u>12,186</u>	<u>7,861</u>	Cont	TBD
Total	9,314	15,356	9,874	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops systems to detect, warn against, decontaminate, and protect personnel and equipment from a nuclear, biological and chemical environment and provide a critical deterrent to the use of nuclear, biological and chemical weapons. Without these protective systems, sortie generation on a sustained basis will be degraded significantly. "Nuclear" has been added to the title of this program element to provide for radiological detection and protection.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:1. (U) Project 3321, Detection and Warning:

Develops detectors to warn personnel of nuclear, biological, and chemical contamination.

(U) FY 1992 Accomplishments:

- (U) Initiated study to determine shortfalls of USAF equipment in biological warfare defense and to develop a road map for R&D.
- (U) Initiated study to develop road map for multi-functional radiological detectors.

(U) FY 1993 Planned Program:

- (U) Complete threat-based concept studies for Multi-functional Radiological and Biological Detectors.
- (U) Initiate testing of non-developmental Automatic Mustard Agent Detectors (AMAD) and Multi-Functional Radiological (MFR) Detectors for an FY94 production award.
- (U) Integrate Nuclear, biological and chemical detectors into an automated system.

(U) FY 1994 Planned Program:

- (U) Award an Engineering and Manufacturing Development contract for an Individual Vapor Detector.
- (U) Conduct a threat-based concept study and begin concept development for an Aircraft Interior Detector.

(U) Work Performed By: Work performed by Battelle, Engineering Management Support, Brooks AFB, TX. In-house Development organizations responsible for elements of the program are the Human Systems Center Brooks AFB TX, and the Armstrong Laboratory, located at both Brooks AFB TX and Wright Patterson AFB, OH.

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Program Element: #0604601F

PE Title: Nuclear, Biological
and Chemical Defense
Equipment

Budget Activity: #4 - Tactical Programs

(U) Related Activities:

- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0603231F, Crew Systems Technology.
- (U) Program Element #0604617F, Air Base Operability.
- (U) Program Element #0604703F, Aeromedical Chemical Defense System Development.
- (U) Program Element #0603806A, Chemical/Biological Defense Equipment Advanced Development.
- (U) Program Element #0603514N, Ship Survivability.
- (U) Program Element #0604506N, Biological/Radiological/Chemical Warfare Countermeasures.
- (U) Program Element #0603635M, Marine Corps Ground Combat/Support Arms.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement (BA 4)

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
AMAD	0	0	1,000	Cont	TBD
MFR	0	0	1,302	Cont	TBD
COST	0	0	2,302	Cont	TBD

(U) International Cooperative Agreements:

Not Applicable.

2. (U) Project 3337. Individual Protection:

Based upon changing world conditions chemical/biological weapons have emerged as a major threat to our forces. Because of this, the using commands have issued operational requirements to protect personnel against agents while minimizing the impact to their performance. The Air Force is developing clothing and equipment (both aircrew and ground crew) to protect personnel in chemical/biological environments.

(U) FY 1992 Accomplishments:

- (U) Continued Aircrew Eye/Respiratory Protection (AERP) DT&E/OT&E for the B-IB.
- (U) Continued Passive Anti-Drown Device (PADD) development for AERP.
- (U) Initiated Engineering Change Proposals (ECPs) to correct Armor Quick Disconnect (AQD), Demist Hose Kinking and Hose Length deficiencies for AERP.
- (U) Completed concept study and materials configuration review for the Ground Crew Ensemble (GCE).
- (U) Awarded Engineering, Manufacturing Development (EMD) contracts for Disposable Eye/Respiratory Protection (DERP).

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Program Element: #0604601F

PE Title: Nuclear, Biological
and Chemical Defense
Equipment

Budget Activity: #4 - Tactical Programs

(U) FY 1993 Planned Program:

- (U) Complete B-1B DT&E/OT&E of AERP.
- (U) Complete Development and Testing of PADD and AERP ECPS.
- (U) Develop E-3 Class V modification design for AERP.
- (U) Complete AERP integration package design for C-12, C-20, C-21, C-22, C-26, EC-130, MC 130, AC-130U and MC-130H.
- (U) Award EMD contract for GCE and initiate DT&E.
- (U) Continue DT&E of DERP.
- (U) Award Post-Operation Desert Storm production contract for Aircrew Ensemble, to complete USAF requirements.
- (U) Spike in FY 93 is because AERP expenditures were less than expected in FY 1992 and the AERP program will be essentially completed in FY 93.

(U) FY 1994 Planned Program:

- (U) Complete DT&E/OT&E on DERP for a FY95 production award.
- (U) Complete DT&E, conduct early operational assessment and initiate OT&E on GCE for an FY95 production award.

(U) Work Performed By: Work for AERP is performed by ILC Dover, Frederica, DE. In-house development organizations for this and all other tasks under this project are Human Systems Center (HSC), Brooks AFB, TX; and several Air Logistics Centers whose Headquarters are at Air Force Material Command, Wright-Patterson AFB, OH. Contractors for DERP are ILC Dover, Frederica, DE; Mine Safety Appliances, Murrysville, PA; and National Draeger, Pittsburgh, PA. Contractors for GCE will be determined at contract award.

(U) Related Activities:

- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0603231F, Crew Systems Technology.
- (U) Program Element #0604617F, Air Base Operability.
- (U) Program Element #0604703F, Aeromedical Chemical Defense System Development.
- (U) Program Element #0603806A, Chemical/Biological Defense Equipment Development.
- (U) Program Element #0603514N, Ship Survivability.
- (U) Program Element #0604506N, Biological/Radiological/Chemical Warfare Countermeasures.
- (U) Program Element #0603635M, Marine Corps Ground Combat/Support Arms.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement (BA 4) (BPAC 8400)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
3080					
AERP	<u>15.100</u>	<u>11.971</u>	<u>5.216</u>	<u>Cont</u>	<u>TBD</u>
Cost	15,100	11,971	5,216	Cont	TBD
	(U) Aircraft Procurement (BA 4)				
AERP	<u>0</u>	<u>3.200</u>	<u>3.500</u>	<u>Cont</u>	<u>TBD</u>

(U) International Cooperative Agreements:
Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604602F
 PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2784 Armament Standardization/Control/Munitions Materiel Handling Equipment (MMHE)	2,243	1,509	1,898	Cont.	TBD
3133 Bombs and Fuzes	800	1,225	7,610	Cont.	TBD
4003 Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATTV)	700	1,990	500	0	6,704
5613 Containers	<u>1,682</u>	<u>1,115</u>	<u>1,399</u>	<u>Cont.</u>	<u>TBD</u>
Total	5,425	5,839	11,407	Cont.	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Armament Standardization/Control/Munitions Material Handling Equipment (MMHE) Project and the Container Design Retrieval System (CDRS) Project satisfy several USAF and tri-service requirements for standardization of armament and support equipment. This project saves the Air Force money by eliminating unnecessary duplication of MMHE and containers. The Bombs and Fuzes Project satisfies TAF ROC 323-75, Proximity Fuzes, dated 2 Sep 75; TAF SON 305-85, Hardened Target Munitions, dated 14 Oct 86; OSD letter requirement for a common bomb fuze, dated 11 Apr 80; SAC message 041901Z Feb 87, M117 High Drag Capability(s); and Joint Mission Need Statement TAF 401-91 for Adverse Weather Precision Strike Capability, dated 4 Nov 91. This project funds development of specific fuze types for air-to-ground munitions. The Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATTV) Project satisfies TAF SON 314-87, ATAAT/ATTV, dated 18 Nov 88, and funds development of an improved munitions trailer and tow vehicle.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2784, Armament Standardization/Control/MMHE: This continuing project improves standardization and commonality and development of improved munitions handling equipment in Air Force armament systems to preclude duplication and proliferation.

(U) FY 1992 Accomplishments:

- (U) Completed design and initiated procurement of Universal Wing and Fin Rack to support flight line delivery of air-to-air missiles.
- (U) Completed development of rail extenders for the MHU-110 munitions trailer, increasing bomb capacity from 12 to 18.
- (U) Completed development of the AGM-130 stackable stand to improve initial combat generation capability.
- (U) Completed development of the B-52 pylon maintenance and loading stand which improved deployability.

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Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

- (U) Completed development of the B-1 CBM loading adapter, significantly improving deployability.
- (U) Completed training of 173 engineers on MIL-STD-1760.
- (U) FY 1993 Planned Program:
 - (U) Continue design of the ATAAT trailer deck to accommodate munitions assembly.
 - (U) Complete modification to the Rapid Assembly Munitions System to improve utility.
 - (U) Design a Transport Device to improve deployability of Aerospace Ground Equipment (AGE).
 - (U) Complete development of 25/40 foot trailer mobility rails.
 - (U) Continue evaluation of robotic applications to MMHE.
 - (U) Continue evaluation of candidate universal armament tester.
- (U) FY 1994 Planned Program:
 - (U) Complete the design of the ATAAT trailer deck.
 - (U) Continue to evaluate advanced technology in ammo loaders.
 - (U) Continue evaluation of robotic applications to MMHE.
 - (U) Prototype and test Mobility Transport Device.
 - (U) Complete evaluation of candidate universal armament tester.
 - (U) Continue Reliability Maintainability and Development initiatives to improve MMHE utility.
- (U) Worked Performed By: Aeronautical Systems Center, Directorate of Armament Control (ASC/ALZ) at Eglin AFB, FL manages this project. Support contractors are: Technical Engineering Acquisition Support (TEAS), Sverdrup Technologies, Tullahoma, TN; Technical Engineering Acquisition Management Support (TEAMS), RMS Technologies, Inc., Marlton, NJ, and Information and Systems Network Corporation, Bethesda, MD.
- (U) Related Activities:
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
 - (U) PE 64618F, JDAM 1 and 3.
- (U) Other Appropriation Funds (\$ In Thousands):
 - (U) Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 3133 Bombs and Fuzes: This project develops and improves conventional bombs and fuzes including the development of a unitary warhead fuze for the Joint Direct Attack Munition (JDAM) program.
 - (U) FY 1992 Accomplishments:
 - (U) Completed development and awarded a production contract for the BSU-93/B high drag tail fin assembly.
 - (U) Began Product Improvement Plan (PIP) for high/low drag proximity sensor (DSU-33A/B) for General Purpose Bombs.

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Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

- (U) FY 1993 Planned Program:
 - (U) Continue Product Improvement Program for DSU-33A/B.
 - (U) Begin development of the Joint Programmable Fuze (JPF), a multi-function fuze for Joint Direct Attack Munition and selected inventory weapons.
- (U) FY 1994 Planned Program:
 - (U) Complete PIP to exercise DSU-33A/B production option.
 - (U) Increase in funding above FY 1993 level needed for EMD of the JPF.
 - Specifics follow:
 - (U) Begin design and fabrication of hardware.
 - (U) Begin contractor component test and evaluation.
 - (U) Define aircraft interface definition for JPF.

(U) Work Performed By: The Aeronautical Systems Center, Projects Division, Air-to-Surface Weapons System Program Office (ASC/YHP) at Eglin AFB, FL manages this project. Support contractors are: Technical Engineering Acquisition Support (TEAS), Sverdrup Technologies, Tullahoma, TN; Technical Engineering Acquisition Management Support (TEAMS), RMS Technologies, Inc., Marlton, NJ. Contractor for BSU-93 is Irvin Industry, Roxboro, NC. Contractor for DSU-33A/B is Motorola Inc., Scottsdale, AZ.

- (U) Related Activities:
 - (U) PE 0604618F and PE 0604618N, Joint Direct Attack Munition (JDAM).
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

- (U) Other Appropriation Funds (\$ in Thousands):
 - (U) Other Procurement, PE 0208030F

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
BSU-93/B (BA-61, P-1 line item 13)					
Funds	6,742	0	0	0	6,742
Qty	6,144	0	0	0	6,144
DSU-33 A/B Proximity Sensor (BA-61, P-1 line item 31)					
Funds	6,500	0	20,563	0	27,063
Qty	300	0	11,576	0	11,876

- (U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4003, Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATTV): This project will develop a munition assembly trailer and tow vehicle capable of transporting and assembling munitions in support of aircraft sortie generation at damaged or bare base airfields.

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Program Element: #0604602E
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

- (U) FY 1992 Accomplishments:
 - (U) Completed Phase II of the Small Business Innovative Research (SBIR) contract which proved the ATAAT/ATTV concept.
- (U) FY 1993 Planned Program:
 - (U) Begin ATAAT development.
 - (U) Begin ATTV qualification activities.
- (U) FY 1994 Planned Program:
 - (U) Continue ATAAT development.
 - (U) Begin ATAAT qualification testing activities.
 - (U) Continue ATTV qualification testing to vehicle selection.
- (U) Work Performed By: The Aeronautical Systems Center, Projects Division, Air-to-Surface Weapons System Program Office (ASC/YHP) at Eglin AFB, FL, manages this project. Support contractors are: Technical Engineering Acquisition Support (TEAS), Sverdrup Technologies, Tullahoma, TN; Technical Engineering Acquisition Management Support (TEAMS), RMS Technologies, Inc., Marlton, NJ. ATAAT/ATTV EMD Contractors are TBD. North American Dynamics, Tustin, CA, was the contractor on the SBIR effort for the ATAAT program.
- (U) Related Activities:
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 4. (U) Project 5613, Containers: This project funds operation of the tri-service Container Design Retrieval System (CDRS). This system includes the maintenance of a container database to preclude proliferation and duplication of munitions containers. It also supports organic container design, prototyping, and testing capabilities.
 - (U) FY 1992 Accomplishments:
 - (U) Delivered first container set for MILSTAR transportable terminal system and Israeli HAVE NAP missile.
 - (U) Completed development efforts on BSU-93/B tail fin container and awarded production contract.
 - (U) Completed development of an AGM-130 all-up-round container and awarded production contract.
 - (U) Continued development, design and testing for the MILSTAR, Improved Data Link (IDL) Pod, High Speed Airdrop Container (HISAC), T-55 Helicopter engine, and Petroleum Oil Lubricant (POL) Rapid Utility Repair Kit (RURK) programs.
 - (U) Began development for the High Speed Container Delivery System (HSCDS), and the JSOC half pallet medical container.

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Program Element: #0604602E
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

- (U) FY 1993 Planned Program:
 - (U) Begin development of the JSOW and HARM Section containers, as well as the GBU-28 pallet.
 - (U) Continue development and testing for HSCDS, Half Pallet Medical, POL RURK, IDL Pod, HISAC, and T-55 Helicopter engine Container programs.
 - (U) Develop and deliver two container sets for the MILSTAR transportable terminal system.
 - (U) Award production contract for the POL RURK container system program.
- (U) FY 1994 Planned Program:
 - (U) Continue development and testing for the HSCDS, Half Pallet Medical, IDL Pod, HISAC, T-55 Helicopter Engine, and the GBU-28 pallet.
 - (U) Continue development and testing of the following containers: DSU-33 Proximity Sensor Fuze, HARM Section and JSOW.
 - (U) Begin development of the JDAM container.
 - (U) Upgrade CDRS automated system and improve the CDRS database.
- (U) Work Performed By: The Aeronautical Systems Center, Packaging and Transportation Division, Joint Tactical System Program Office (ASC/YJA) at Eglin AFB, FL, manages this project.
- (U) Related Activities:
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ In Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604604F
PE Title: Submunitions

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3166 Joint Smart Munitions Test and Evaluation Program	4,990	7,063	3,835	Cont	TBD
Total	4,990	7,063	3,835	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project 3166, commonly known as "Chicken Little", is a joint US Air Force/US Army project which evaluates developmental smart munitions and related emerging technology with applications against mobile ground vehicle targets by determining antiarmor/counter-battery munition performance against actual foreign targets in realistic environments and in the presence of countermeasures. Originally formed to assist development of "top attack" smart munitions, the project has broadened to reduce developmental risk for all smart munitions designed to attack mobile targets. The project leverages technology, joint experience, and test and evaluation dollars to Air Force, Army, and Navy during early and mid-term system development efforts in this area. Data gathered is also used to meet developmental decision points requiring highly reliable, realistic performance data. The project is a major focal point for joint Air Force and Army target signature collection and dissemination for development and exploitation purposes. Armor and other mobile tactical targets required to evaluate seeker/sensor performance, model target vulnerability, and support signature evaluation, have been acquired under this project.

C. (U) JUSTIFICATION OF PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3166, Joint Smart Munitions Test and Evaluation Program: Evaluates munition performance against fixed/mobile ground targets.

(U) FY 1992 Accomplishments:

- (U) Initiated Phase III of the program which concentrates on effectiveness assessments for program offices with a focus on countermeasures.
- (U) Conducted Captive Flight Tests (CFT) of seeker/sensors in snow and desert conditions supporting participants from AF and Army program offices against the Chicken Little target array (with and without countermeasures).
- (U) Completed tower test to gather signature exploitation data on threat armor (with and without explosive reactive armor), advance air defense units, and other vehicles. Tests included first use of very high resolution instrumentation radar.
- (U) Supported Joint Tactical Coordinating Group (JTCCG) in warhead characterization activities; supported establishment of National Armor Anti-armor Data Repository.
- (U) Continued support of weapons systems under development through analysis of the effectiveness of seeker/sensor and warhead combinations and supplying data and analysis to support program office and higher level decisions and milestones.

(U) FY 1993 Planned Program:

- (U) Continue Phase III program with focus on countermeasures.
- (U) Initiate Captive Flight Tests (CFT) with new seeker/sensor against the Chicken Little target set in various climactic settings.

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Program Element: #0604604F
PE Title: Submunitions

Budget Activity: #4 - Tactical Programs

- (U) Support Smart Target Activated Fire-and-Forget (STAFF), Extended Range Penetrator (XROD), Wide Area Mine (WAM), BAT, Hellfire Optimized Missile Systems (HOMS), Sensor Fuzed Weapon (SFW), and Millimeter Wave Maverick.
 - (U) Continue warhead effectiveness and vulnerabilities analysis activities; continue evaluation of future warheads.
 - (U) Continue support of Joint Technical Coordinating Group (JTCG).
- (U) FY 1994 Planned Program:
- (U) Continue Phase III program with focus on countermeasures.
 - (U) Initiate Captive Flight Tests (CFT) with new seeker/sensor against the CHICKEN LITTLE target set in various climatic settings.
 - (U) Support seeker/sensor and algorithm development efforts of Joint Direct Attack Mission (JDAM), Smart Target Activated Fire-and Forget (STAFF), Non-Line-of-Sight (NLOS), BAT, Longbow, Merlin, STRIX, Comanche, and several classified AF & Army programs.
 - (U) Continue warhead effectiveness & vulnerability analysis activities for HARM and other selected warheads against Critical Mobile Targets (CMT) and Suppression of Enemy Air Defense (SEAD) targets.
 - (U) Continue to support Air Combat Command in mission need statement development and concept development analysis for silent hard kill weapons system.
 - (U) Continue warhead effectiveness tests and support to AF and Army program offices including Hellfire, Damocles, STAFF, Sense and Destroy Armor (SADARM), and Wide Area Mine (WAM).
 - (U) Continue to target acquisition, target geometry model development, and terminal guidance efforts in support of Theater Missile Defense (TMD).
 - (U) Continue support of Joint Target Control Group (JTCG) and AF/Army program offices in signature collection/analysis and simulator validation.
 - (U) Expand the CHICKEN LITTLE fleet of vehicles to include CMT, Air Defense Units, and newer Red vehicles.
- (U) Work Performed By: Program management is provided by the Air Force Development Test Center (AFDTC), Eglin Air Force Base, FL. Program office is jointly manned by Army and Air Force personnel.
- (U) Related Activities:
- (U) PE 0604607F, Wide Area Antiarmor Munitions (Sensor Fuzed Weapon).
 - (U) PE 0603628A, Field Artillery Ammunition Development.
 - (U) PE 0604631A, Field Artillery Ammunition.
 - (U) PE 0605807A, Munitions Standardization, Effectiveness and Safety.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609F

PE Title: Reliability & Maintainability Technology
Insertion Program (RAMTIP)

Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES (\$ in Thousands)

Project Title <u>Popular Name</u>	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Reliability & Maintainability Technology Insertion Program (RAMTIP)	18,253	21,692	20,593	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides funding to accelerate development and transition of emerging, high-leverage technologies from the laboratory to the implementation phase. RAMTIP is a "level-of-effort" program focused on developing technologies that alleviate pervasive reliability and maintain-ability problems within the Air Force and DoD. RAMTIP has 19 active projects with a projected return on investment of 7 to 1. Particular emphasis is placed on implementing techniques to migrate RAMTIP products across multiple weapon systems to leverage cost and availability improvements. The efforts listed below represent only a sampling of projects being pursued and are not intended to be a complete listing of all ongoing efforts.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Life of the Airframe Battery: Develops and qualifies a sealed Ni-Cd battery and "smart" charger system with a projected 20-year service life for initial application on the E-8 Joint STARS aircraft. This system will eliminate the need for intermediate level maintenance of the battery system. Technology is generic in nature and can be transfused to other weapon systems.
- (U) On-board Inertial Gas Generation System (OBIGGS): Uses a molecular sieve bed to extract nitrogen rich gas from engine bleed air in order to maintain an inert atmosphere and enhance fire suppression under all operating conditions. Initial application is slated for C-17 aircraft flight testing. Technology is directly transferable to the C-5 and other aircraft. Return on investment is expected to be 2 to 1.

2. (U) FY 1993 Planned Program:

- (U) Digital Map System (DMS): Development will be completed to replace Remote Map Readers. The DMS will be initially implemented as a form, fit, function "plus" replacement for the existing F-15E Remote Map Reader (RMR). This technology is applicable to the F-111 program and several SOF programs. The DMS design will be adapted from an already existing design. However, due to the F-15E mission scope, state-of-the-art mass memory technology will be selected and developed within this project to provide adequate map data coverage. The DMS is expected to increase MTBF (Mean Time Between Failure) from 100 to 2,000 hours. The current system was identified as a poor performer during Desert Storm and is "Number ONE" in the Tactical Air Forces Research, Development, and Acquisition Priorities. The DMS will be designed to support two levels of maintenance and will allow for a decrease in spares, elimination of support equipment, and decrease in mobility requirements. A

20 to 1 return on investment is anticipated.

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Program Element: #0604609F

PE Title: Reliability & Maintainability Technology
Insertion Program (RAMTIP)

Budget Activity: #6-Defense Wide Mission Support

- (U) Testable and Monitorable Modular Mission Computer (TAM-MMC): Will provide for on-board hardware testability and non-intrusive real-time software monitoring. Initial implementation is scheduled for the F-16 aircraft with follow-on application to the Navy F/A-18 aircraft (the project is jointly funded by the Air Force and Navy). TAM-MMC is being designed to support two levels of maintenance and will be capable of detecting 98% of faults with the ability to isolate faults to a single module 95% of the time. This should reduce the mean time to repair from 4 to 0.5 hours, require fewer spares, and reduce mobility requirements for the F-16 by 50%. The project is expected to have a 7 to 1 return on investment for the F-16 application alone, with a 15 to 1 ratio with the addition of the F/A-18.

3. (U) FY 1994 Planned Program:

- (U) Advanced Canopy Coatings: Will complete during 1Q FY 94 and transparencies with improved abrasion coatings will be initially fielded on the F-16 aircraft on a preferred spares basis. Return on investment is conservatively estimated to be 15 to 1.
- (U) On-Board Pyrotechnic Initiation: Initiate development effort. This three-year project will adapt a laser ordnance system to replace shielded mild detonating cord (SMDC) in crew escape systems application. Technology focus is on lasers and fiber optics. Current SMDC-initiated devices must undergo periodic age-sensitive change-outs, which are very costly. Crew ejection seats and overall systems operation remain essentially the same. A RAMTIP conducted study has shown that the B-1B crew escape system and ACES-II seat are the best applications.

4. (U) Program to Completion:

- (U) This is a continuing program.

D. (U) Work Performed By: The RAMTIP Program Office is part of the Technology Transition Office (AFMC) located at Wright-Patterson AFB, OH. Other organizations involved are: HQ USAF, HQ AFMC, product centers, logistics centers and laboratories. The largest participating contractors are McDonnell-Douglas, St Louis MO; General Dynamics, Fort Worth TX; and Lockheed Aeronautical Systems Company, Marietta GA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Not applicable.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

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Program Element: #0604609F

PE Title: Reliability & Maintainability Technology
Insertion Program (RAMTIP)

Budget Activity: #6-Defense Wide Mission Support

G. (U) RELATED ACTIVITIES:

- (U) Productivity, Reliability, Availability & Maintainability Program (PE 0708026F).
- (U) All RAMTIP projects are closely coordinated with the AF laboratories to preclude duplication of effort and to take advantage of technology advances emanating from the laboratory environment.
- (U) All RAMTIP projects are reviewed for potential Army/Navy interest, and dialogue is established in cases where commonality of problems exist such that solutions become DoD-wide.
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands)

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604617F
PE Title: Air Base Operability

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2621 Rapid Runway Repair	3,686	5,274	3,423	Cont	TBD
2895 Air Base Operability	2,630	3,776	4,035	Cont	TBD
3141 Camouflage, Concealment, and Deception	660	1,041	166	Cont	TBD
4057 Survivable Airbase Utility Systems	2,910	2,834	2,430	Cont	TBD
4058 Advanced Firefighting	0	661	969	Cont	TBD
Total	9,886	13,586	11,023	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program integrates numerous ongoing efforts and provides for Engineering and Manufacturing Development (EMD) of selected air base operability (ABO) systems. Sustained airfield operations are a prerequisite for a successful air campaign. Base and theater commanders must have the capability and resources to defend their main or forward airfields and to return them to operational status after sustaining an attack.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2621. Rapid Runway Repair (RRR):

This full-scale development program develops the technology, procedures, and equipment to rapidly repair large, deep craters in runways and taxiways as well as smaller, pothole-sized spalls caused by enemy munitions.

(U) FY 1992 Accomplishments:

- (U) Continued development of Repair Quality Criteria (RQC) for the KC-135 and E-3A.
- (U) Initiated development of RQC for the KC-10.
- (U) Initiated EMD for Automated Spall Repair/Advanced Crater Capping.
- (U) Began EMD of RRR Mat Anchoring.

(U) FY 1993 Planned Program:

- (U) Complete development of RQC for KC-135 and KC-10 aircraft; perform model validation testing of the KC-10.
- (U) Award EMD contract for Automated Spall Repair System.
- (U) Initiate Pre-Planned Product Improvement for Edge Markers in the Minimum Operating Surface (MOS) Marking program.
- (U) Award EMD Contract for Vibratory Upheaval Reduction Program.
- (U) Continued EMD of Mat Anchoring.
- (U) Complete EMD for Mobile Aircraft Arresting System (MAAS) Upgrade.

(U) FY 1994 Planned Program:

- (U) Initiate RQC development for B-52 & C-17 and complete KC-10.
- (U) Award EMD Contract for Vibratory Upheaval Reduction Program.
- (U) Complete EMD on Mat Anchoring Program.

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Program Element: #0604617F
PE Title: Air Base Operability

Budget Activity: #4 - Tactical Programs

(U) Work Performed By: Program contractor is BDM MSC, Panama City, FL. In-House Development organizations responsible for elements of the program are the Air Force Civil Engineering Support Agency, Tyndall AFB, FL, and the Air Force Weapons Laboratory, Kirtland AFB NM.

(U) Related Activities:

- (U) Program Element #0603307F, Air Base Operability Advanced Development
- (U) Program Element #0603723F, Civil/Environmental Engineering Technology.
- (U) Program Element #0207596F, Base Operations, Tactical Air Forces.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement 3080/84000:

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
RRR EQUIP	6,992	1,953	0	Cont	TBD

(U) International Cooperative Agreements:
Not Applicable.

2. (U) Project 2895, Air Base Operability:

Air Base Operability integrates ground support mission to improve sortie generation capability when an attack occurs on or close to an air base.

(U) FY 1992 Accomplishments:

- (U) Completed Explosive Hazard Reduction (EHR) on 40MM Grenade for Operations and Storage
- (U) Completed Contingency Airfield Lighting System (CALS) Operational Test & Evaluation (OT&E).
- (U) Conducted Development Test and Evaluation (DT&E) for the Base Recovery After Attack Communication system (BRAATCOM).
- (U) Conducted test for safe armory storage of 40mm grenade containers, accomplished site surveys, and certified 500k pound explosives for Storage Modules in the EHR Munitions Storage Program.
- (U) Updated World Wide ABO Threat Compendium.

(U) FY 1993 Planned Program:

- (U) Initiate pre-planned product improvement for CALS.
- (U) Fabricate a Mobile Ordnance Disrupter prototype system.
- (U) Plan and support the BRAATCOM IOT&E.
- (U) Update World Wide ABO Threat Compendium.

(U) FY 1994 Planned Program:

- (U) Perform full scale test of the Mobile Ordnance Disrupter System and make decision to proceed with next phase.
- (U) Continue system classification upgrades and Wing Command and Control System (WCCS) two-way interface for BRAATCOM.
- (U) Update World Wide ABO Threat Compendium.

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Program Element: #0604617F
PE Title: Air Base Operability

Budget Activity: #4 - Tactical Programs

(U) Work Performed By: Program contractors are Sumaria Systems Inc., Wakefield MA for BRAATCOM; Multi-Electric, Chicago IL for CALS; and Alpine Industries, Ogden UT for the M-60 Oracle blade. In-House development organizations responsible for elements of the program are Electronic Systems Center, Hanscom AFB MA; Aeronautical Systems Center, Wright-Patterson AFB, OH; and Aeronautical Systems Center, Eglin AFB, FL.

(U) Related Activities:

(U) This Project transitions advanced development efforts from Program Element #0603307F, Air Base Operability Advanced Development.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement: 3080/84000

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
CALS	6,128	3,300	0	0	9,428
BRAATCOM	0	9,500	4,500	1,800	15,800
EOD EQUIP	0	0	1,386	0	2,346

(U) International Cooperative Agreements:

Not Applicable.

3. (U) Project 3141. Camouflage, Concealment, And Deception (CCD):

This project embraces the full spectrum of camouflage, concealment, and deception methods to mitigate the effectiveness of enemy attacks against air bases.

(U) FY 1992 Accomplishments:

- (U) Initiated Engineering and Manufacturing Development (EMD) of a multi-spectral (visual and infrared) Smoke Generator.

(U) FY 1993 Planned Program:

- (U) Complete EMD for the multi-spectral Smoke Generator and conduct multi-spectral smoke/obscurant evaluation.

(U) FY 1994 Planned Program:

- (U) Conduct IOT&E of Multi-Spectral Smoke.

(U) Work Performed By: Program Contractor is Ball Corp, San Diego, CA for CCD Systems. In-House development organization responsible for the program are Aeronautical Systems Center, Wright Patterson AFB, OH and Aeronautical Systems Center, Eglin AFB, FL.

(U) Related Activities:

(U) Program Element #0603307F, Air Base Operability Advanced Development.

(U) See Project 2895.

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement: 3080/84000

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
CCD	0	4,270	0	Cont	TBD

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Program Element: #0604617F
PE Title: Air Base Operability

Budget Activity: #4 - Tactical Programs

(U) International Cooperative Agreements:
Not Applicable.

4. (U) Project 4057, Survivable Air Base Utility Systems (SABUS):
This project will provide Rapid Utility Repair Kits (RURK) designed specifically for each utility type: Petroleum, Oils, and Lubricants (POL); electrical-interior; electrical-exterior; and water/sewerage.

(U) FY 1992 Accomplishments:

- (U) Continued development and completed IOT&E of POL RURK, Phase I.
- (U) Conducted in-ground surveys and commercial practice surveys for water and electrical RURK.
- (U) Initiated EMD efforts for POL RURK, PHASE II.

(U) FY 1993 Planned Program:

- (U) Continue EMD of POL RURK, Phase I.
- (U) Continue development of POL RURK, Phase II.
- (U) Award EMD contract and conduct vulnerability tests for water/sewerage, and electrical RURK.

(U) FY 1994 Planned Program:

- (U) Complete EMD of POL RURK, Phase I.
- (U) Continue development of electrical RURK.
- (U) Continue development of water/sewerage RURK.
- (U) Complete IOT&E of POL RURK, Phase II.

(U) Work Performed By: Program Contractors are BDM Corporation, Panama City, FL and Idaho National Engineering Laboratories, Idaho Falls, ID In-House development organization responsible for the program are the Air Force Civil Engineering Support Agency, Tyndall AFB FL, the Air Force Weapons Laboratories, Kirtland, AFB NM, and Aeronautical Systems Center Eglin AFB, FL.

(U) Related Activities:

- (U) Program Element #0603307F, Air Base Operability Advanced Development.
- (U) Program Element #0603723F, Civil/Environmental Engr Tech

(U) Other Appropriation Funds (\$ in Thousands):

(U) Other Procurement: (BA 4)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
POL RURK	0	6,304	8,280	Cont	TBD

(U) International Cooperative Agreements:
Not Applicable.

5. (U) Project 4058, Advanced Firefighting:

This project will design, test and evaluate vehicle hardening kits and enhance the capability of War Reserve Materiel fire fighting vehicles to include off-road capability. This project will also provide a Deployable Fire Protection System and develop a training program.

(U) FY 1992 Accomplishments:

Not Applicable.

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Program Element: #0604617F Budget Activity: #4 - Tactical Programs
 PE Title: Air Base Operability

(U) FY 1993 Planned Program:

- (U) Begin a program to develop an ABO Deployable Fire Protection system.

(U) FY 1994 Planned Program:

- (U) Continue development of an ABO Deployable Fire Protection System.

(U) Work Performed By: Program Contractors are to be determined. In-House development organizations responsible for the program are the Air Force Civil Engineering Support Agency, Tyndall AFB FL, the Air Force Weapons Laboratories, Kirtland, AFB NM, and Aeronautical Systems Center, Eglin AFB, FL.

(U) Related Activities:

- (U) Program Element #0602206F, Civil Engineering & Environmental Quality Assurance.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Other Procurement: (BA 4)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
ADV FF	0	0	900	Cont	TBD

(U) International Cooperative Agreements:
 Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604618F

Project : # 3890

PE Title: Joint Direct Attack Munitions

Budget Activity : #4 - Tactical Programs

Project Title: Joint Direct Attack Munitions

NO PICTURE AVAILABLE BECAUSE OF THE EARLY STAGE OF THE PROGRAM.

POPULAR NAME: JDAM

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones	MS 0 Jun	JDAM 1 MS I: Jun	JDAM 3 MS I: Mar	JDAM 1: MS II: 3Q/95 MS III: 3Q/99 JDAM 3: MS II: 4Q/96, III:4Q/99
Engineering Milestones	N/A	N/A	JDAM 1 PDR: TBD* SRR:TBD*	JDAM 1 CDR: Mar 95 FCA & PCA: TBD*
T&E Milestones	N/A	N/A	N/A	JDAM 1 DT 4Q/96; OT 4Q/97
Contract Milestones	N/A	N/A	JDAM 1 Contract Award EMD (compet. dev/mfg):Nov JDAM 3 Contract Award Dem/Val: Aug	JDAM 1 Downselect Option: Jan 95; LRIP I Opt: 4Q/97; LRIP II Opt: 4Q/98; LRIP III Opt: 4Q/99; FRP: 4Q/00
BUDGET				Program Total
(\$000)	FY 1992	FY 1993	FY 1994	(To Complete)
Major Contract	N/A	9,396	TBD	TBD
Support Contract	N/A	6,512	TBD	TBD
In-House Suprt.	N/A	3,484	TBD	TBD
GFE/Other	N/A	3,156	TBD	TBD
Total	N/A	22,548	87,822	577,427

* SRR and PDR to be determined upon contract award.

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Operation Desert Storm revealed the need for a more accurate weapon delivery capability in adverse weather conditions and from medium/high altitudes. Failure to satisfy this requirement will allow the enemy to continue to take advantage of the sanctuary of weather and/or prevent US air power from prosecuting a conflict on its terms. JDAM is a three part, concurrent Air Force and Navy munitions program to correct these shortfalls, with the Air Force as the executive service. JDAM 1 will upgrade the existing inventory of general purpose bombs (MK 84 and BLU-109/B) by integrating them with a guidance kit

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Program Element: #0604618F
PE Title: Joint Direct Attack Munitions

Project : #3890
Budget Activity : #4 - Tactical Programs

inventory of general purpose bombs (MK 84 and BLU-109/B) by integrating them with a guidance kit consisting of a global positioning system aided inertial navigation system (INS/GPS). JDAM 1 will provide an accurate adverse weather capability. The program will incorporate, where feasible, INS/GPS commonality with the Joint Standoff Weapon (JSOW) program managed by the Navy. JDAM 1 will initially be integrated with the B-1B and F/A-18C/D aircraft. JDAM 2a will be an Air Force managed fuze improvement program (Joint Programmable Fuze) funded in PE 0604602F (Armament/Ordnance Development). This effort will provide complete fuzing options for the JDAM products as well as an upgrade to the existing inventories of fuzes. JDAM 2b will develop a new 500-pound warhead, managed by the Navy, and funded in PE 0604603N. JDAM 2c is a product improvement program for the Proximity Sensor (DSU-33A/B) and is funded in PE 0208030F. JDAM 3 will develop a precision guidance capability to improve the accuracy of the JDAM 1 developed weapon, with maximum commonality with the Navy JSOW unitary weapon version. The following sections address only JDAM 1 and 3, which are funded in PE 0604618F.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Not applicable. This is a FY 1993 new start.

2. (U) FY 1993 Planned Program:

JDAM 1

- (U) Obtain Milestone I approval.
- (U) Begin JDAM 1 aircraft interface definition. The B-1B and F/A-18C/D will be primary aircraft, with others to follow.

JDAM 3

- (U) Begin precision guidance concept exploration, including both seeker and non-seeker options such as relative targeting; aircraft integration studies; and threat analysis.

3. (U) FY 1994 Planned Program:

JDAM 1

- (U) Begin competitive design and manufacturing processes portion of Engineering and Manufacturing Development (EMD).
- (U) Complete primary aircraft interface definition.
- (U) Conduct wind tunnel and weapon environmental characterization.

JDAM 3

- (U) Conclude evaluation of alternative methods for precision accuracy, and conduct a Cost and Operational Effectiveness Analysis (COEA).
- (U) Obtain Milestone I approval.
- (U) Begin Demonstration and Validation (Dem/Val) contract efforts.

4. (U) Program to Completion:

JDAM 1

- (U) Downselect to one contractor and complete EMD, aircraft integration, production, and deployment.

JDAM 3

- (U) Conclude precision guidance Dem/Val, and perform EMD, aircraft integration, production, and deployment.

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Program Element: #0604618F
PE Title: Joint Direct Attack Munitions

Project : # 3890
Budget Activity : #4 - Tactical Programs

- D. (U) Work Performed By: For JDAM 1 and 3, this is a FY 1993 new start. No contracts have been awarded for JDAM 1 yet. The Deputy, Air-to-Surface Weapons, Aeronautical Systems Center (ASC/YH-2), Eglin AFB, FL manages the JDAM 1 program for the AF Program Executive Officer for Conventional Strike (AFPEO/TS). JDAM 1 will start with two contractors, followed by a downselect to one contractor in FY 1995 to continue EMD. The aircraft prime contractors, under direction from the aircraft SPOs, will perform the weapon/aircraft integration. For JDAM 3, four contracts were awarded in February 1993 to evaluate various concepts for precision accuracy. These contracts were awarded to the following companies: Coleman Research Corporation, Orlando, FL; Nichols Research Corporation, Huntsville, AL; SRI International, Menlo Park, CA; and The Analytical Sciences Corporation (TASC), Reading, MA and Fort Walton Beach, FL. The Deputy, Air-to-Surface Weapons, Aeronautical Systems Center (ASC/YHR), Eglin AFB, FL will manage this program for the Commander, Aeronautical Systems Center, Wright-Patterson AFB, OH until MS I at which time it will transfer to the AFPEO/TS.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

JDAM 1

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Milestone 0 DAB held in June 1992. Milestone 0 Acquisition Decision Memorandum established Milestone I/II date in FY 1993. Subsequent decision made to request only MS I approval. EMD Contract Award changed from Jun to Nov due to acquisition strategy revisions and JDAM/JSOW commonality determination. Options for LRIP I changed to 4th Qtr/FY 1997, LRIP II to 4th Qtr/FY 1998; LRIP III to 4th Qtr/FY 1999, and the FRP award to 4th Qtr/FY 2000 primarily due to the changes in acquisition strategy, change to a Milestone I decision, and the resultant delay in contract award.
3. (U) COST CHANGES: Reprogramming actions and other assessed reductions in FY 1993 were made commensurate with the delay in the program start. FY 1994 changes were caused by changes in program structure such as: including the competitive design and manufacturing development processes phase prior to downselect; deletion of an option to provide an interim B-2 capability; and a revised schedule based on an early FY 1994 contract award.

JDAM 3

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGE: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC/TAF Mission Need Statement #401-91, validated 5 Mar 92.
- (U) Joint CAF/USN Operational Requirements Document (ORD) CAF-401-91-A dated 2 Apr 92.

G. (U) RELATED ACTIVITIES:

JDAM 1

- (U) PE #0604602F, Armament/Ordnance Development (JDAM 2a: Joint Programmable Fuze).
- (U) PE #0604727N, Joint Standoff Weapon System.
- (U) PE #0604603N, Air-to-Surface Munitions.
- (U) Joint Potential Designator to be determined at Milestone I.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

JDAM 3

- (U) PE #0604727N, Joint Standoff Weapon System.

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Program Element: #0604618F
PE Title: Joint Direct Attack Munitions

Project : #3890
Budget Activity : #4 - Tactical Programs

- (U) PE #0604602F (JDAM 2a: Joint Programmable Fuze).
- (U) Joint Potential Designator to be determined at Milestone I.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands)

(U) Procurement (projected): (PE 0207165F)

JDAM 1

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	0.0	0.0	0.0	TBD	TBD
Qty	0	0	0	60,000	60,000

JDAM 3

Cost	0.0	0.0	0.0	TBD	TBD
Qty	0	0	0	5,000	5000

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
None	None	None

T&E ACTIVITY (TO COMPLETION)

JDAM 1

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
DT	4th Qtr/FY 1996	Start JDAM development (first fully guided flight) testing .
IOT&E	4th Qtr/FY 1997	Start JDAM 1 initial operational testing.

JDAM 3

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
TBD	TBD	TBD

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604703F
PE Title: Aeromedical Systems Development

Project Number: 2866
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2866 Aeromedical/Casualty Care Systems Development	6,368	6,559	10,260	Cont	TBD
Total	6,368	6,559	10,260	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

1. (U) Mission Requirement:

Provides engineering development, modification, qualification, test and evaluation, procurement, and support planning of medical equipment and systems for treatment, evacuation, and prediction of wartime casualties in a chemical or conventional warfare environment. Tactical, strategic, and covert aeromedical evacuation systems and unique medical treatment equipment are developed and fielded to meet Air Force medical readiness and operational requirements. Aerospace medical training systems are also developed and fielded to improve training of flight surgeons, flight nurses, medical technicians, and other medical personnel.

2. (U) System Capabilities:

This project consists of the following activities: 1) Civil Reserve Air Fleet Aeromedical Evacuation Shipsets (CRAF AESS) is providing production kits for converting Boeing 767 passenger aircraft into aeromedical evacuation platforms; 2) Transportable Blood Transshipment Center (TBTC) which will be able to receive, store, re chill, and ship both liquid and frozen blood products to enhance the DoD blood distribution system; 3) The Chemically Hardened Air Transportable Hospital (CHATH) which will provide the capability to operate worldwide in chemical threat environments; 4) Spinal Cord Injury Transport System (SCITS) which will develop a system for aeromedical transport of spinal cord and neck injury patients/casualties from overseas to CONUS without causing additional trauma; 5) Aeromedical Equipment Evaluation (AMEE) tests off-the-shelf or prototype medical equipment to comply with electromagnetic interference standards, altitude decompression requirements, and FAA regulations; 6) Aerospace Medicine Training System (AMTS) will provide computer-based training to medical personnel; 7) Attrition Analysis System (THREAT) will estimate personnel attrition rates incorporating all known threats for Air Force planning and programming; 8) Medical Contingency Planning System (WARMEDPS) will produce a simulation model that provides iterative analysis of

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Program Element: #0604703F
PE Title: Aeromedical Systems
Development

Project Number: 2866
Budget Activity: #4 - Tactical Programs

manpower and resource allocation of the wartime medical system; 9) Operational Analysis performs modeling and analysis to identify performance deficiencies in the existing patient regulating and transportation information system; and 10) Integrated Medical Systems Management (IMSM) conduct a study to investigate the viability of consolidation of Air Force medical acquisition activities into an integrated process; and (11) Field Medical Laser System (FMLS) will provide a medical tool for instantaneous cutting, coagulation and closure of combat wounds for special operations forces. 12) Alternating Current Interface Unit (ACIU) will provide an R&M upgrade to the LIFEPAK 10 Cardiac Monitor that allows operations on aircraft power vs batteries. 13) Continuous/Intermittent Suction Unit (CISU) will provide an automatic medical suction system for nasogastric and chest tube use aboard aeromedical aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Civil Reserve Air Fleet Aeromedical Evacuation Shipsets (CRAF AEES) - completed development and conducted functional configuration audit/physical configuration audit.
- (U) Transportable Blood Transshipment Center (TBTC) - conducted preliminary design review and began critical item engineering tests.
- (U) Spinal Cord Injury Transport System (SCITS) - completed pre-engineering and manufacturing development (pre-EMD) study.
- (U) AMEE - test and evaluate new litters for use on AF aircraft.

2. (U) FY 1993 Planned Program:

- (U) CRAF AEES - deliver shipsets and spares.
- (U) CHATH - award up to three EMD contracts, prototype for chemically/biologically hardened air management plant (CHAMP).
- (U) SCITS - release EMD Request for Proposal (RFP).
- (U) AMEE - test and evaluate Extra Corporeal Membrane Oxygenation (ECMO) System for C-9 flight certification.
- (U) AMTS and FMLS - conduct pre-EMD studies.
- (U) THREAT - begin EMD effort.
- (U) ACIU - award EMD task order contract.
- (U) TBTC - conduct program management reviews, design and interim systems reviews and environmental and engineering testing.

3. (U) FY 1994 Planned Program:

- (U) TBTC - conduct critical design review.
- (U) CHATH - test CHAMP prototypes and down select to one EMD contract.
- (U) SCITS - conduct preliminary design review.
- (U) AMTS, THREAT, SCITS and FMLS - award EMD contracts.

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Program Element: #0604703F
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Project Number: 2866
Budget Activity: #4 - Tactical Programs

- (U) ACIU - complete development and award production contract.
- (U) CISU - award EMD task order contract and complete development.

4. (U) Program to Completion: This is a basket PE which contains various USAF/SG programs that are developed and procured on a continuous basis.

D. (U) Work Performed By: Project is managed by the Aeromedical Systems Division, Human Systems Program Office, Human Systems Center (HSC), Brooks AFB, TX. The contractors are: E-Systems, Greenville, TX; Arthur D. Little, Cambridge, MA; and BDM Int'l Corp., McLean, VA. In-house developing organizations at Brooks AFB are the Operational Analysis Systems Division at HSC and the Aeromedical Function of the Armstrong Laboratory.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: No technical changes have occurred since the FY 1993 Descriptive Summary.
2. (U) SCHEDULE CHANGES: The schedule changed for two of the programs in FY 93: SCITS and TBTC. For SCITS, the delay in the coordination and signing of the Operational Requirements Document (ORD) from the 2QTR to the 3QTR FY 93 will cause contract award to slip from the 4QTR of FY 93 to the 1QTR of FY 94. For TBTC, the prime contractor, Authur D. Little, Inc, underestimated the scope and technical complexity of the program which moved the critical design review (CDR) from 1QTR FY 93 to 1QTR FY 94.
3. (U) COST CHANGES: There was cost growth in the TBTC program of \$2.5M in FY 94 and \$2.0M in FY 95 due to underestimation of the program scope and technical complexity by Authur D. Little, Inc.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 301-81, 30 Jan 81, (S), Mobile Medical Second Echelon System (Validated 20 Jul 81).
- (U) MAC SON 005-82, 4 Feb 83, (S), Aeromedical Evacuation in a Chemical/Biological Environment (Validated 4 Nov 83).
- (U) Joint Service Agreement, Joint Service Coordination of Chemical Warfare and Chemical Biological Defense Requirements, Research, Development and Acquisition, 5 Jul 84.
- (U) USAF SON 004-85, (S/NOFORN), Sustained Operations in a Chemical/Biological Environment, HQ USAF/XOO (Validated 19 Sep 86)
- (U) USAF MNS 002-92, 24 Jan 92, Wartime Medical (WAR-MED) Planning System.

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PE Title: Aeromedical Systems
Development

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- (U) USAF SON 002-88, 15 May 91, Threat Related Attrition (THREAT) System.
- (U) TAF (USAF 004-S) -I-L SORD, 3 Jul 89, Chemically Hardened Air Transportable Hospital (CHATH), draft.
- (U) MAC SORD 014-89-1, 13 Sep 89, Transportable Blood Transshipment Center (TBTC).
- (U) MAC SORD 002-90, 29 Jan 90, Aeromedical Evacuation Civil Reserve Air Fleet (AE CRAF) Segment, draft.
- (U) Refer to Air Force Air Base Operability Program Security Classification Guide (1 Nov 89) and Aeronautical Systems Division's Security Classification Guide, Chemical and Biological Defense Programs (1 Apr 84), which provides guidance for security classification.
- (U) JROCM MNS-075-92, DOD Biological Defense, Aug 92.
- (U) ACC ORD CAF 004-85-I-R, Chemically Hardened Air Transportable Hospital, 25 Jan 93.
- (U) AMC CAF Multi-Command MNS 213-92, Spinal Cord Injury Transport System (SCITS), 26 Feb 93.
- (U) AMC CAF Multi-Command ORD (Draft) 213-92-I, Spinal Cord Injury Transport System (SCITS), 9 Feb 93.

G. (U) RELATED ACTIVITIES:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604601F, Nuclear, Biological and Chemical Warfare Defense.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology
- (U) The Army is DoD lead for Chemical Warfare Defense; this project works Air Force-unique requirements.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Programs under this PE have joint command interest.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

	<u>IOC</u>	<u>FOC</u>
1. (U) TBTC	3/95	3/97
2. (U) CHATH	4/96	4/98
3. (U) SCITS	1/97	1/98
4. (U) THREAT	1/95	4/97
5. (U) WARMEDEPS	3/97	3/00
6. (U) FMLS	3/00	3/01
7. (U) ACTIU	3/94	3/95
8. (U) CISU	1/97	3/97
9. (U) AMTS	3/98	3/99

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604704F

Budget Activity: #4 - Tactical Programs

PE Title: Common Support Equipment

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Actual</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2479 Common Support Equipment Development	1,437	971	2,693	Cont	TBD
3759 Air Force Office of Support Equipment Management	463	500	700	Cont	TBD
3852 60,000 Pound Capacity Aircraft Transporter Loader	<u>14,535</u>	<u>7,400</u>	<u>1,400</u>	<u>Cont</u>	<u>TBD</u>
Total	16,435	8,871	4,793	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports projects that develop, test, evaluate, and field improved flight line, base level, and depot level support equipment (SE) to meet the operational needs of both Global Reach and Global Power projection forces; which is not available through nondevelopment item and commercial off-the-shelf acquisitions. Its goal is to limit proliferation, increase standardization, reduce the deployment footprint, and enhance performance, availability, reliability, and maintainability, thereby reducing life cycle costs. Common SE is needed to minimize the operational and support burden imposed by the proliferation of non-military, weapon system unique SE. Common SE efforts reduce SE proliferation, assure maximum operational capability for dollars invested, and reduce the SE burden for operational commands and supporting agencies. This program element also develops software for planning tools such as the Support Equipment Acquisition Management System and for automation of SE data bases to support planning and development activities. The program element further implements the Air Force Office of Support Equipment Management (AFOSEM) objective to develop, support, distribute, and maintain products that improve Air Force SE acquisitions. It also supports studies that develop recommendations to improve the SE acquisition management processes. AFOSEM activities support the DoD Standardization and Specifications program objective to decrease SE proliferation, increase systems standardization, and improve weapon systems interoperability. This program element is also required to provide an air transportable, transporter-type loader with the capability to accommodate six pallets or a Type V airdrop platform carrying 60,000 pounds in a single load. It will be the backbone of the Global Reach airlift 463L system and improve mobility deployment for the present military and Civil Reserve Air Fleet as well as the C-17.

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Program Element: #0604704F
PE Title: Common Support Equipment

Budget Activity: #4 - Tactical Programs

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1993:

1. (U) Project 2479, Common Support Equipment Development: This project develops and tests common SE to fill a continuing need for better combat effectiveness, lower life cycle costs, and greater returns on investment. The Advanced X-Ray System (AXES) effort will develop a rugged, deployable, high resolution x-ray system which integrates state-of-the-art x-ray technology for field-level nondestructive inspection of structural flaws, foreign substances, and corrosion in inaccessible or otherwise undetected components of aircraft, engines, and missiles.

(U) FY 1992 Accomplishments:

- (U) Completed "30%" Reviews for Operator & Maintenance Technical Orders for the Advanced X-Ray System (AXES).
- (U) Completed Critical Design Review (CDR) for AXES.
- (U) Started Developmental Test & Evaluation (DT&E) for AXES.

(U) FY 1993 Planned Program:

- (U) Complete "70%" Review of Operator T.O.s for AXES.
- (U) Complete DT&E for AXES (includes Operator T.O. validation).
- (U) Begin Initial Operational Test & Evaluation (IOT&E) for AXES.
- (U) Conduct Functional Configuration Audit (FCA) for AXES.

(U) FY 1994 Planned Program:

- (U) Complete IOT&E for AXES.
- (U) Complete Verification of Operator T.O.s for AXES.
- (U) Complete "70%" Review of Maintenance T.O.s for AXES.
- (U) Validate Maintenance T.O.s for AXES.
- (U) Plan for an Enhanced Mobility System (EMS) for the Ground Power Generator System (GPGS).

- (U) Work Performed By: The top contractors are Teledyne Power Systems (TPS), Mobile, AL; and ITW/Magnaflux, Chicago, IL. The in-house developing organization is the Air Force Materiel Command, Aeronautical Systems Center, Wright Patterson Air Force Base, OH.

- (U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

- (U) Other Appropriation Funds (\$ in Thousands): Procurement Funding: 3010 Appropriations/Budget Program 1200/Common Support Equipment.

(U) Procurement:

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost (AXES)	0	6,714	0	14,104	20,818

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Program Element: #0604704F
PE Title: Common Support Equipment

Budget Activity: #4 - Tactical Programs

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3759, Air Force Office of Support Equipment Management:

This project develops the tools and training required to increase support equipment (SE) standardization throughout DoD, and reduce proliferation of SE. The Support Equipment Acquisition Management System (SEAMS) now provides, for System Program Director (SPD) and Product/Material Group Manager (PGM/MGM), on-line search of DoD stock listed SE.

(U) FY 1992 Accomplishments:

- (U) Used the Automated SE Extraction Data System (ASEEDS) to increase SE items in SEAMS.
- (U) Conducted a formal MIL-HDBK-300 Use Survey.

(U) FY 1993 Planned Program:

- (U) Further expand the SEAMS database using ASEEDS.
- (U) Model a revised SE identification/acquisition process.
- (U) Evaluate SEAMS architecture for re-engineering.
- (U) Develop a Database Model and formal requirements definition for SEAMS.
- (U) Develop a SE Master Planning Guide.

(U) FY 1994 Planned Program:

- (U) Prototype the automated, revised SE identification/acquisition process.
- (U) Re-engineer SEAMS using Computer Aided Software Engineering (CASE) tool set.

(U) Work Performed By: The top contractors are RJO, Dayton, OH; and Atlantic Research Corporation Fairborn, OH. In-house organization is the Air Force Materiel Command, Headquarters Aeronautical Systems Center, Wright Patterson Air Force Base, OH.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3852, 60,000 Pound Capacity Aircraft Transporter Loader:

This project develops a 60,000 pound capacity aircraft transporter/loader to fulfill the requirements of Military Airlift Command (MAC) System Operational Requirements Document (SORD) 002-89-1. The program provides the capability for a single loader to on/offload C-5, C-141, C-130, C-17, C-23, C-27, C-160, KC-10, and Civil Reserve Air Fleet (CRAF) aircraft. The 60K

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Program Element: #0604704F
PE Title: Common Support Equipment

Budget Activity: #4 - Tactical Programs

loader will provide the combined capabilities of the 40K loader, wide-body elevator loader, and lower lobe loader. The 60K loader will be able to be driven on/off of the C-141, C-5, and C-17 aircraft without shoring. The 60K loader will be significantly more reliable with 100 hours Mean Time Between Failure (MTBF) versus the 40K loader 18 hours MTBF. Major reductions in deployment preparation times will be made (30 Man-hours to 3 man-hours). Air Force-wide a 10% reduction in overall loading time is projected. With the 60,000 pound capacity this will be the only loading vehicle capable of moving a Type V airdrop platform carrying a full 60,000 pounds required by the U.S. Army.

(U) FY 1992 Accomplishments:

- (U) Developed test procedures for Development Test & Evaluation (DT&E) and Initial Operational Test & Evaluation (IOT&E).
- (U) Conducted Logistics Support Analysis (LSA).
- (U) Completed 80% of Prototype Fabrication and Assembly.
- (U) Completed 40% Technical Manual In Process Review.
- (U) Completed Program Evaluation Review.

(U) FY 1993 Planned Program:

- (U) Complete fabrication and assembly of prototype loaders.
- (U) Complete the combined DT&E and IOT&E.
- (U) Begin the dedicated IOT&E.
- (U) Complete the Physical Configuration Audit (PCA).
- (U) Complete validation and begin verification of Technical Manuals and conduct Operator and Maintenance Training.
- (U) Complete Production Manufacturing Plans.
- (U) Conduct DT&E Review.
- (U) Conduct Production Readiness Review (PRR).

(U) FY 1994 Planned Program:

- (U) Incorporate IOT&E Design/Technical Manual changes.
- (U) Complete verification of Technical Manuals.
- (U) Modify Prototype Loaders to the Production Configuration and Test Modified Loaders, to include design changes.
- (U) Modify Logistics Support Package.

(U) Work Performed By: The prime contractors are Southwest Mobile Systems, St Louis, MO; and Teledyne Brown Engineering, Huntsville, AL. The in-house developing organization is the Air Force Materiel Command, Warner Robins Air Logistics Center, Robins Air Force Base, GA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0604704F
PE Title: Common Support Equipment

Budget Activity: #4 - Tactical Programs

(U) Other Appropriation Funds (\$ in Thousands): Procurement Funding:
3080 Appropriations/Budget Program 8200/Vehicles.

(U) Procurement: BSA 6205/WSA 825120

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u> Cont	Total <u>Program</u> TBD
Cost (60K Loader)	0	0	27,601		

(U) International Cooperative Agreements: Not Applicable.

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FY 94 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604706F
PE Title: Life Support Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
412A Life Support Systems	5,680	7,599	10,006	Cont	TBD
3111 Aircraft Mishap Prevention Program	4,207	3,759	768	0	12,782
3812 COMBAT EDGE	2,497	686	250	0	20,106
Total	12,384	12,044	11,024	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the only Air Force program element devoted to Engineering and Manufacturing Development (EMD) of aircrew life support equipment. Project 412A is the core project providing centralized management of life support items and subsystems such as flight clothing, flight helmets, oxygen breathing equipment for aviators, anti-G coveralls, survival radios, night vision devices, and aircraft ejection seats. These items are critically needed to assure safety and functional capability of aircrews throughout all mission environments and to enhance survival and recovery in emergency and wartime situations. It also provides for EMD of emergency equipment and protective clothing and devices for non-flying personnel. Project 3111 develops a management information system to reduce loss of aircrew lives and aircraft due to human factors. Project 3812 accelerates development and fielding of a pressure breathing for G system for F-15 and F-16 crew members to help reduce incidents of G-induced loss of consciousness and increase pilot endurance under high-G combat conditions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3111, Aircraft Mishap Prevention Program: This project develops a system to analyze the human factor elements in aircraft mishaps. The results will assist the Air Force in the reduction of aircraft mishaps and the loss of human life. This project develops a central operational system within the Air Force Safety Agency (AFSA).

(U) FY 1992 Accomplishments:

- (U) Conducted System Design Review.
- (U) Conducted System software specification review.

(U) FY 1993 Planned Program:

- (U) Conduct Critical Design Review.
- (U) Conduct Test Readiness Review.
- (U) Complete Development Test and Evaluation.

(U) FY 1994 Planned Program:

- (U) Perform System configuration and physical configuration audits.
- (U) Conduct Analyst training.
- (U) Support AFSA system introduction.

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Program Element: #0604706F
PE Title: Life Support Systems

Budget Activity: #4 - Tactical Programs

(U) Work Performed By: Human Systems Center, Brooks AFB, TX manages project 3111. The prime contractor is ETA Technologies Corp., San Diego, CA.

(U) Related Activities:

(U) PE #0603231F, Crew Systems Technology.

(U) PE #0602241F, Ejection Seat Bio-Dynamics.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: (\$ in Thousands)

(U) Operations and Maintenance Appn 3400, PE 91212F.

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u> Cont	Total <u>Program</u> TBD
Cost	275	816	1,066		

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3812, COMBAT EDGE: This project accelerates development and fielding of a pressure breathing for G (PPG) system for F-15 and F-16 crew members. It will use the G-protection aspects that have been under development in the Tactical Life Support System (TLSS). These include the lower body anti-G suit garment, an upper torso anti-G garment, a lightweight helmet modified with a tensioning bladder, a new oxygen mask, and a modification to the existing oxygen regulator.

(U) FY 1992 Accomplishments:

- (U) Completed IOT&E.
- (U) Completed Functional Configuration Audit and Physical Configuration Audit.
- (U) Awarded Design Improvement Contract.

(U) FY 1993 Planned Program:

- (U) Conduct Follow-On Operational Test and Evaluation (FOT&E) on System Improvements.
- (U) Conduct in-house Flight Test Program for Mask Improvement/Integration.
- (U) Support joint program initiatives with Navy.

(U) FY 1994 Planned Program:

- (U) Conclude FOT&E.
- (U) Continue FOT&E on mask and other manside improvements (visor, vest, helmet bladder).

(U) Work Performed By: Human Systems Center, Brooks AFB, TX manages the Combat Edge project (#3812). Boeing Aircraft Company, Seattle, WA is the prime contractor with Gentex Corp. (East), Carbondale, PA and Gentex Corp. (West), Pomona, CA, the main subcontractor(s). Systems Research Laboratory, Dayton, OH is a prime on the manside improvements.

(U) Related Activities:

(U) PE #0602201F, Aerospace Flight Dynamics.

(U) PE #0602202F, Aerospace Biotechnology.

(U) PE #0603211F, Aerospace Structures/Materials.

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Program Element: #0604706F
PE Title: Life Support Systems

Budget Activity: #4 - Tactical Programs

- (U) PE #0603231F, Crew Systems Technology.
- (U) PE #0602241F, Ejection Seat Bio-Dynamics.
- (U) PE #0602758N, Biomedical Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: (\$ in Thousands)

- (U) Aircraft Procurement Modification, Appn 3010, PE 27133F, F-16 Squadrons, BA 5, BP 11, P-1 Line Item F-16.
- (U) Operations and Maintenance, Appn 3400, PE 27133F, F-16 Squadrons.
- (U) Aircraft Procurement Modification, Appn 3010, PE 27130F, F-15 Squadrons, BA 5, BP 11, P-1 Line Item F-15.
- (U) Operations and Maintenance, Appn 3400, PE 27130F, F-15 Squadrons.

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u> Cont	Total <u>Program</u> TBD
Cost	16,685	11,338	0		

- (U) International Cooperative Agreements: COMBAT EDGE will be releasable to F-16 European Participating Group (EPG) and Foreign Military Sales (FMS) countries. General Dynamics is currently working with EPG/FMS countries to determine requirements for both production incorporation and retrofit of existing aircraft.

3. (U) Project 412A, Life Support Systems: Provides for EMD of life support equipment and subsystems to satisfy operational command requirements for improved life support equipment to maximize aircrew capability throughout all environments and to enhance survivability in emergency situations.

(U) FY 1992 Accomplishments:

- (U) Completed Active Noise Reduction (ANR) Critical Design Review
- (U) Initiated ANR qualification testing
- (U) Completed UWARS Preliminary Design Review and Critical Design Review.
- (U) Fabricated UWARS Test Article.
- (U) Released Request For Proposal for Night Vision System (NVS).
- (U) Began Qualification Test and Evaluation for Thermal Flashblindness Protection Device (TFPD).

(U) FY 1993 Planned Program:

- (U) Award Engineering and Manufacturing Development (EMD) contract for Night Vision System (NVS).
- (U) Conduct Night Vision System (NVS) Preliminary Design Review.
- (U) Support advanced development of Advanced Technology Anti-G System (ATAGS).
- (U) Provide technical support to F-22 EMD program for life support equipment design and testing.
- (U) Define AFSOC requirements for Active Noise Reduction (ANR).
- (U) Conduct studies on combining Aircrew/Eye Respiratory Protection (AERP) and pressure breathing equipment.
- (U) Initiate Qualification Test and Evaluation of Universal Water Activated Release System (UWARS).

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Program Element: #0604706F
PE Title: Life Support System

Budget Activity: #4 - Tactical Programs

(U) FY 1994 Planned Program:

- (U) Award Engineering and Manufacturing Development (EMD) contract for ATAGS.
- (U) Conduct Night Vision System (NVS) DT&E and IOT&E.
- (U) Provide technical support to F-22 EMD program for life support equipment design and testing.
- (U) Provide technical support for UWARS production contract.
- (U) Provide technical support for award of production contract for TFPD.
- (U) Award EMD contract for Passenger Smoke and Fume Protection program.
- (U) Conduct Development Test & Evaluation on Active Noise Reduction (ANR).

(U) WORK PERFORMED BY: Air Force Material Command's Human Systems Center (HSC), Brooks AFB, TX, manages the Life Support Systems, Project 412A. Support is also provided by other Service organizations. The major contractors involved in this project include: ALAR Productions, Inc., Kent, OH; Boeing Aircraft Company, Seattle, WA; Gentex Corp. Carbondale, PA (East) and Pomona, CA (West); Conax Florida Corp., St Petersburg, FL; H. Koch & Sons, Anaheim, CA; Bose Corp, Framingham, MA; Ketron Inc, Malvern, PA; ARO Corp., Buffalo, NY; S-Tron Corp., Redwood City, CA, and Systems Research Laboratory, Dayton, OH.

(U) RELATED ACTIVITIES:

- (U) PE #0602201F, Aerospace Flight Dynamics.
- (U) PE #0602202F, Aerospace Biotechnology.
- (U) PE #0603211F, Aerospace Structures/Materials.
- (U) PE #0603231F, Crew Systems Technology.
- (U) PE #0602723A, Clothing, Equipment and Shelter Technology.
- (U) PE #0604204A, Air Mobility Support Equipment.
- (U) PE #0602241F, Ejection Seat Bio-Dynamics.
- (U) PE #0602758N, Biomedical Technology.
- (U) PE #0603216N, Mission Oriented Clothing and Devices.
- (U) PE #0604264N, Aviation Personnel Life Support System.
- (U) PE #0603216N, Aircrew System Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Other Procurement, OPAF/Other Base Maintenance and Support, BA 4, Items Less Than \$2.0M (Safety and Rescue Equipment), P-1 Line Item 166.
- (U) Other Procurement (BA 4)

	FY 1992	FY 1993	FY 1994	To	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Cost	1,318	4,025	5,982	Cont	TBD

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604707F
PE Title: Weather Systems (Eng Development)

Budget Activity: #6 - Defense - Videl
Mission Support

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
0001 Weather Systems (Engineering Development)	5,497	6,119	9,299	Cont	TBD
Total	5,497	6,119	9,299	Cont	TBD

- B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element provides engineering development of weather systems that will eliminate critical shortfalls in weather support to Air Force and Army operations. Efforts include: (a) Automated Weather Distribution System (AWDS): automates most weather data handling tasks within Army and Air Force weather stations. AWDS is a planned Product Improvement (P3I) will enhance interoperability between AWDS, command and control (C2) systems, and processing facilities. P3I will also develop the capability to import meteorological satellite and weather radar data into AWDS. (b) Battlefield Weather Observation and Forecast System (BWOFS): develops an interactive weather data base for input into Electro-Optical Tactical Decision Aids (EOTDAs). EOTDAs provide commanders critical environmental forecasts for precision-guided munitions employment decisions. (c) Solar Electro-Optical Network Upgrade (SEON II): develops upgraded solar radio and optical capabilities to detect and forecast solar activity which could impact DOD systems. (d) Combat Weather System (CWS): combines the functionalities of AWDS and BWOFS with automated battlefield weather observations to produce tailored in-theater weather forecasts.

C. (U) JUSTIFICATION FOR SINGLE PROJECT LESS THAN \$10.0 MILLION IN FY 1994:

(U) FY 1992 Accomplishments:

- (U) AWDS/P3I: Demonstrated prototypes; began development of interface with customer system, OT&E enhancements, and improvements to seven algorithms.
- (U) BWOFS: Completed Phase II software enhancements and installed in testbed; integrated Phase II into C2 systems; began Phase III.
- (U) SEON II: Developed specifications/RFP for radio solar telescope prototype..
- (U) CWS: Developed specification for a Tactical Forecast System (TFS) rapid prototyping contract and follow-on Integration/Production contract; initiated communications architecture study; assisted lab development of theater models.

(U) FY 1993 Planned Program:

- (U) AWDS/P3I: Develop/demonstrate rapid prototypes for FY93/94 P3I contracts; complete development of C2 systems interface and IOT&E enhancements; award contract for Remote Briefing Capability (RBC) and inter-AWDS communication development efforts.
- (U) BWOFS: Complete Phase III software enhancements, install in testbed, and assist in integration into C2 systems.
- (U) SEON II: Award development contract for the radio solar telescope prototype.
- (U) CWS: Award contract for TFS prototyping efforts, to include integration of AWDS/BWOFS software; continue development of specifications and RFP for Integration/Production contract..

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Program Element: #0604707F
PE Title: Weather Systems (Eng Development)

Budget Activity: #6 - Defense-Wide
Mission Support

(U) FY 1994 Planned Program:

- (U) AWDS/P3I: Develop/demonstrate rapid prototypes for FY94/95 P3I contracts; complete inter-AWDS P3I efforts; award contract for development of interface capability for weather satellite receiving systems and WSR-88D doppler radar.
- (U) BWOFS: Complete phase IV and transition to CWS program.
- (U) CWS: Complete TFS prototyping effort. Release RFP package to industry and begin source selection for Integration/Production contract for CWS. Continue efforts to tailor Portable Reusable Integration Software Modules (PRISM) for CWS configuration.

(U) Work Performed By: AWDS, BWOFS, SEON II, and CWS development are managed by Electronic Systems Center (ESC), Hanscom AFB, MA. The AWDS contractor is GTE/Contel Corporation, Westlake Village, CA who will produce/field AWDS units and provide ten years of contractor logistics support. Computer Sciences Corporation (CSC) is the contractor for BWOFS, developing the interactive weather database and integrating the EOTDA software onto theater command and control systems. The initial CWS/TFS prototype efforts use the ESC Portable Reusable Integration Software Modules (PRISM) contract (Raytheon and Hughes teamed effort). The CWS Integration/Production contract will be awarded in FY 95. SEON II will award a sole source contract to California Institute of Technology (Caltech) for building the radio solar telescope prototype.

(U) Other Appropriation Funds: Procurement funds in PE 35111F.

(U) International Cooperative Agreements: Not applicable.

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FY 1994/1995 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604708F
 PE Title: Other Operational Equipment

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2054 Aerospace Facilities Engineering Development	381	377	754	Cont	TBD
2505 Aircraft Fire Fighting, Suppression and Rescue	837	910	1,392	Cont	TBD
2674 Tactical Shelters	835	754	1610	Cont	TBD
3788 Environmental Quality	530	<u>472</u>	<u>768</u>	<u>Cont</u>	<u>TBD</u>
<u>Total</u>	2,583	2,513	4,524	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the development, testing and evaluation of materials, equipment and procedures in four separate areas: a) Facilities Engineering improves the operational effectiveness, survivability, durability, and longevity of air base pavements, buildings and utilities; the overall objective is to provide an infrastructure that effectively supports the USAF mission, contributes to high sortie rates, is less susceptible to damage from enemy actions or natural disasters, and is more rapidly returned to service if damaged. b) Fire Fighting Suppression and Rescue develops new concepts and technology applications to increase fire fighting support of combat operations, to improve base recovery after attack capabilities, and to reduce fire risks to personnel and resources. c) Tactical Shelters is the USAF portion of a tri-service effort to develop standardized, low maintenance, survivable shelters and shelter accessories that are easily mobilized and compatible with air, sea and land transport systems. These products will effectively support high-mobility aircraft support, command and control, communications, medical, and data processing units for the tactical and strategic forces. d) Environmental Quality reduces long-term disposal/cleanup costs and helps ensure USAF compliance with Environmental Protection Agency (EPA) regulations through development of means to identify hazardous waste and pollutant sources, reduce output of sources, mitigate the effects of wastes and pollutants, and dispose of wastes when contamination occurs.

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Program Element: #0604708F
PE Title: Other Operational Equipment

Budget Activity: #4 - Tactical Programs

This project also develops environmentally less hazardous materials, processes, and technologies to support the Chief of Staff and Secretary of the Air Force's Pollution Prevention Action Plan.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN BOTH FY 1994:

1. (U) Project 2054, Aerospace Facilities Engineering Development: Develops equipment, materials, and procedures to improve the operational effectiveness of aerospace facilities.
 - (U) FY 1992 Accomplishments:
 - (U) Initiated development of non-ozone layer depleting substances (OLDs) mobile heating and air conditioning systems.
 - (U) Developed and tested a new 5 ton mobile heating and air conditioning system prototype for potential applications with Bare Base operations.
 - (U) Initiated development of kit for emergency structural repairs to critical battle-damaged facilities. Will transfer to PE# 604617F
 - (U) Initiated investigative study on commercial availability of non-OLDs refrigerant and processing hardware.
 - (U) Determined commercially available non-OLDs refrigerants and hardware. 134a type refrigerants are acceptable for the next Environmental Control units for a New Family of Air Force Shelters.
 - (U) Initiated evaluation of a commercial solar water heating reflective dish system.
 - (U) FY 1993 Planned Program:
 - (U) Continue development of non-OLDs mobile heating and air conditioning systems for a New Family of Air Force Shelters. Develop prototype systems and plan EMD/production/deployment program.
 - (U) Continue development of commercial solar energy systems for military application.
 - (U) Exploit commercial technology for military applications (i.e. Mobile Utilities Program for Bare Base Projects).
 - (U) FY 1994 Planned Program:
 - (U) Continue development of non-OLDs mobile heating and air conditioning systems.
 - (U) Continue development of commercial solar energy systems for military application.
 - (U) Exploit commercial technology for military applications.
 - (U) Explanation for Funding Ramp-up Funding increase in FY 94 and outyears supports development of an advanced Environmental Control Unit (ECU) to meet mission requirements and comply with current and projected environmental laws and regulations. The new ECU will weigh 50% smaller in volume, consume 30% less energy and operate with NON-OZONE depleting refrigerants.
 - (U) Program to Completion:
 - (U) Continue development of non-OLDs mobile heating and air conditioning systems.
 - (U) Continue development of commercial solar energy systems for military application.
 - (U) Exploit commercial technology for military applications.

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Program Element: #0604708F
PE Title: Other Operational Equipment

Budget Activity: #4 - Tactical Programs

- (U) Work Performed By: Work is performed by the in-house developing organization, ASC/YO, Eglin AFB, Florida.
- (U) Related Activities:
 - (U) PE #0603723F, Civil and Environmental Engineering Technology
 - (U) PE #0602206F, Civil Engineering and Environment
 - (U) PE #0603211F, Aerospace Structures.
 - (U) PE #0604617F, Air Base Operability
 - (U) Close cooperation is maintained with other services via the Joint Services Civil Engineering Research and Development Coordinating Group, and Project Reliance.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 2. (U) Project 2505, Fire Fighting, Suppression, and Rescue: Develops improved fire fighting, suppression and rescue equipment, materials, and methods to increase fire protection readiness, mobility, and effectiveness.
- (U) FY 1992 Accomplishments:
 - (U) Awarded contract for development of chemical warfare kit for new self-contained breathing apparatus. (SCBA/CW)
 - (U) Initiated development of Deployable Fire Protection Systems (DFPS).
 - (U) Tested prototype dry chemical agent system for the P-19 vehicle.
 - (U) Initiated development of interactive video Readiness Training System (RTS) software for B-1, F-16, and C-5 aircraft.
 - (U) Tested high reach agent dispensing system on P-19 vehicle and conduct source selection for EMD.
- (U) FY 1993 Planned Program:
 - (U) Continue development of DFPS.
 - (U) Continue development of RTS software, to include C-17 and CRAF (747) aircraft.
 - (U) Production delivery SCBA.
- (U) FY 1994 Planned Program:
 - (U) Initiate production of DFPS.
 - (U) Continue development of RTS software.
 - (U) Review/evaluate commercial and foreign firefighting products for Air Force application.

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Program Element: #0604708F
PE Title: Other Operational Equipment

Budget Activity: #4 - Tactical Programs

- (U) Explanation of Funding Ramp-up Funding increase in FY 94 and outyears supports the continued development and test of the Deployable Fire Protection System (DFPS). The DFPS program will field a mobile, stand alone system to provide fire protection for aircraft and equipment during integrated combat turns (rearm and refuel with engine/systems operating), aircraft and equipment in bare base shelters, munition buildup areas, and other high value facilities.
- (U) Production delivery SCBA/CW kit continues.
- (U) Program to Completion:
 - (U) Production delivery of DFPS.
 - (U) Continue assessment of commercial/foreign firefighting products.
 - (U) Continue development of additional RTS software.
 - (U) Initiate product improvement to add machine vision detector and turret aiming technology to DFPS.
 - (U) Production delivery SCBA/CW kit continues.
- (U) Work Performed By: Work is performed by the in-house developing organization, ASC/YO, Eglin AFB, Florida.
- (U) Related Activities:
 - (U) PE #0603723F, Civil and Environmental Engineering Technology.
 - (U) PE #0602206F, Civil Engineering and Environmental Quality.
 - (U) Close cooperation is maintained with other services via the Joint Services Civil Engineering Research and Development Coordinating Group and Project Reliance.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.
- 3. (U) Project 2674, Tactical Shelters: Provides for joint service development and acquisition support of tactical shelter systems to improve and standardize shelter designs throughout DoD.
- (U) FY 1992 Accomplishments:
 - (U) Completed development of Test Rack Shock Emulator.
 - (U) Continued testing and qualification studies of new manufacture and repair materials/processes.
 - (U) Continued support efforts for EMI/EMP issues.
 - (U) Continued Shelters 2000 Program to develop new technologies for tactical shelters. Completed testing of composite shelters. Initiated Small Business Innovative Research (SBIR) contract on EMI Shielding for composite shelters and seam gaskets.
 - (U) Continued ISO shelter tie down system project for protecting aircraft transport.

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Program Element: #0604708F

Budget Activity: #4 - Tactical Programs

PE Title: Other Operational Equipment

- (U) Continued technology data base compilation. Data base will be used to support shelter users and future product improvement programs.

(U) FY 1993 Planned Program:

- (U) Continue testing and qualification studies of new manufacture and repair materials/processes.
- (U) Continue support efforts for EMI/EMP issues.
- (U) Continue Shelters 2000 Program for new technologies development on tactical shelters. Continue SBIR contract on EMI shielding for composite shelters and seam gaskets. Complete Phase 1 analysis and initiate Phase 2 prototype production.
- (U) Continue ISO shelter die down system project.
- (U) Continue technology data base compilation.

(U) FY 1994 Planned Program:

- (U) Continue testing and qualification studies of new manufacture and repair materials/processes .
- (U) Continue support efforts for EMI/EMP issues .
- (U) Continue Shelters 2000 Program for new technologies development on tactical shelters. Continue SBIR contract on EMI shielding for composite shelters and seam gaskets. Continue Phase 2 prototype production.
- (U) Complete technology data base compilation.
- (U) Explanation of Funding Ramp-up Funding increase supports the Shelter Technology (SHELTECH) office to develop the next generation of tactical shelters. User (ACC, AMC, etc.) requirements for increased hardening for EMI/EMP, ballistic protection for personnel/equipment, lightweightness, and improved reliability/supportability drive this increase. In addition, Desert Shield/Storm demonstrated the need for Chemical/Biological (C/B) protection and upgraded compatibility with aircraft 463L pallet systems to decrease shelter airlift requirements. Currently, a C/B hardwall shelter does not exist in the ISO community.

(U) Program to Completion:

- (U) Complete testing and qualification studies of new manufacture and repair materials/processes.
- (U) Continue support efforts for EMI/EMP issues.
- (U) Continue Shelters 2000 Program for new technologies development on tactical shelters.

- (U) Work Performed by: Work is performed by the in-house developing organization, Electronic Security Command, Hanscom AFB MA. Work is performed by the following contractors: RJO Enterprise, Bedford MA; Horizon Technology, Billerica MA; Mitre Corp, Bedford MA.

(U) Related Activities:

- (U) Close cooperation is maintained with other services via the Joint Committee on Tactical Shelters.

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Program Element: #0604708F
PE Title: Other Operational Equipment

Budget Activity: #4 - Tactical Programs

- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: (a) Germany: #DEA-A-64-G-1037; Title, Accessories and Organizational Equipment; 1964 (b) Israel: #DEA-A-86-IS-1313; Title, Mobile Shelters and Organizational Equipment; 1986 (c) France: #DEA-A-87-F-1356; Title, Mobile Shelters; 1987.
- 4. (U) Project 3788, Environmental Quality: Develops means to identify hazardous waste and pollutant sources, reduce output of sources, mitigate the effects of wastes and pollutants, provide cost-effective disposal of waste, and conduct site remediation.
- (U) FY 1992 Accomplishments:
 - (U) Continue predictive mesoscale model of rocket launches and the collection and integration of aircraft and VOC data for the emissions dispersion modeling system (EDMS).
 - (U) Initiated development of chemical analysis techniques for JP-4/JP-8 contamination data for use in categorizing fuel spills and supporting environmental impact assessment and cleanup plan preparation.
- (U) FY 1993 Planned Program:
 - (U) Complete predictive mesoscale model of rocket launches and the collection and integration of aircraft and VOC data for the EDMS.
 - (U) Complete assimilation and integration of JP-4/JP-8 contamination data as a tool for categorizing fuel spills and conducting cleanup plans and impact assessments.
- (U) FY 1994 Planned Program:
 - (U) Initiate full-scale demonstration of effectiveness of standardized test methods and procedures for various remediation site monitoring devices to accurately depict subsurface conditions and minimize site clean-up costs.
 - (U) Demonstrate and produce final design guidance manual for liquid phase catalytic reactor to cost-effectively destroy organic compounds that are polluting groundwater.
- (U) Program to Completion:
 - (U) Complete demonstration of standardized test methods and procedures for all integrated monitoring technologies used to remediate subsurface contamination.
- (U) Work Performed by: Work is performed by the in-house developing organization, Envionics Directorate, AL/EQ. (Will transition to HSC/YA in FY 94)
- (U) Related Activities:
 - (U) PE #0603723F, Civil and Environmental Engineering Technology.
 - (U) PE #0602206F, Civil Engineering and Environmental Quality.
 - (U) Close cooperation is maintained with other services via the Joint Services Civil Engineering Research and Development Coordinating Group and Project Reliance.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0604708F

Budget Activity: #4 - Tactical Programs

PE Title: Other Operational Equipment

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604711F
 PE Title: System Survivability (Nuclear Effects)

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (\$ In Thousands)

<u>Project Number & Title</u>	<u>FY1992 Actual</u>	<u>FY1993 Estimate</u>	<u>FY1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2485 Survivability/Vulnerability (S/V) Assessment of Ground C3 Systems	660	756	958	Cont	Cont
3763 S/V Assessment of Aerospace Systems	<u>5906</u>	<u>5282</u>	<u>2685</u>	<u>Cont</u>	<u>Cont</u>
TOTAL	6566	6038	3643	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element develops and demonstrates the capability necessary for AF and DoD systems to survive in environments produced by nuclear and advanced technology weapons (ATWs), such as high power microwaves (HPM).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) Project 2485. Survivability/Vulnerability (S/V) Assessment of Ground C3 Systems: Refines and validates S/V assessment methodology for ground C3I systems. Determines ATW and nuclear S/V of selected systems by analysis and testing. Supports development of advanced hardening and HM/HS techniques. Transfers engineering techniques to product divisions, and operating commands for application to systems.

(U) FY 1992 Accomplishments:

- (U) Completed fabrication and testing of prototype revolving shielded door.
- (U) Completed design of high voltage electromagnetic pulse (EMP) filter.
- (U) Developed analytical and test techniques for high frequency (HF) electromagnetic (EM) threats, including EMP, HPM, and high power radio frequency (HPRF) sources.

(U) FY 1993 Planned Program:

- (U) Plan HPRF weapon experiment support program.
- (U) Conduct first series of HPRF coupling studies on distributed systems w/multiple nodes.
- (U) Collect HAWK EM response data and recommend hardening measures.
- (U) Analyze representative air defense systems for future applications.
- (U) Support extension of HF/ultra wide band (UWB) experiments.

(U) FY 1994 Planned Program:

- (U) Continue development of analytical and test techniques for HF EM threats.
- (U) Evaluate HF EM effects on systems incorporating advanced technology features.

(U) Work Performed By: Kaman Sciences Corp., Mission Research Corp., United International Engineering Inc., both in Albuquerque, NM. Managed by the Phillips Laboratory and the Office of Aerospace Studies, Kirtland AFB, NM.

(U) Related Activities:

- (U) Program Element #0602601F, Advanced Weapons.
- (U) Program Element #0603605F, Advanced Radiation Technology.
- (U) Program Element #0604747F, Electromagnetic Radiation Test Facilities.
- (U) Program Element #0701111F, Airborne and C3I HM/HS.
- (U) There is no unnecessary duplication of effort within the AF or DoD. The USD(A) has established a joint DoD/Service program to coordinate agency EMP technology efforts.

Program Element: #0604711E
 PE Title: System Survivability (Nuclear Effects)

Budget Activity: #3 - Strategic Programs

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3763 Survivability/Vulnerability (S/V) Assessment of Aerospace Systems: Refines and validates S/V assessment methodology for aerospace systems. Determines ATW and nuclear S/V of selected systems by analysis and testing. Supports development of advanced hardening and HM/HS techniques. Transfers engineering techniques to product divisions, operating commands, and commercial users for application to systems. Develops nuclear and ATW survivability parameters (thresholds and objectives) for systems requiring survivability; users and system program offices incorporate parameters into requirement documents, program baselines, and cost and operational effectiveness analyses.

(U) FY 1992 Accomplishments:

- (U) Completed/tested miniaturized instrumentation prototypes for advanced aircraft verification testing programs and miniaturized sensors and techniques for EM testing.
- (U) Initiated distributed propagation path environment simulator studies.
- (U) Upgraded analytical models for prediction/evaluation of nuclear and HPRF effects.
- (U) Upgraded High Frequency Research Facility (HFRF) to 1 GHz capability.
- (U) Performed baseline HF coupling measurements on F-16 testbed.
- (U) Completed high data rate hardened 60 GHz comm link technology development.
- (U) Initiated feasibility studies for a space system survivability controller.
- (U) Conducted hypervelocity impact computations on models of complete satellites.
- (U) Developed improved space environment model to predict radiation dose for satellites.
- (U) Developed testing capability for space environment interaction with satellite systems.
- (U) Developed large scale simulation approach to evaluate space system survivability.
- (U) Published MIL-HDBK on EMP hardening design and verification methods.
- (U) Upgraded continuous wave (CW) simulator to develop system level test technology.
- (U) Developed MILSTAR nuclear survivability parameters, supported MILSTAR Terminal Survivability Working Group.
- (U) Reassessed survivability parameters for MILSTAR radomes for strategic C2 aircraft.
- (U) Published the AFMCP 80-38, Generic Survivability Criteria Handbook.
- (U) Developed generic laser and kinetic energy weapon parameters for AFMCP 80-38.
- (U) Began work on survivability parameters for Follow-on Early Warning System (FEWS).
- (U) Supported Defense Nuclear Agency (DNA) in update of DNA 6500H.

(U) FY 1993 Planned Program:

- (U) Evaluate first generation of miniaturized HF instrumentation for EM testing.
- (U) Improve test techniques of complex cable shield geometries.
- (U) Complete design/evaluation of advanced Ellipticus antenna for low level testing for frequencies up to 1 GHz of aircraft and mobile ground systems.
- (U) Compare Ellipticus and HPD results on EMP Test Aircraft ground system and transition to Tinker AFB, NAS (Patuxent River), DNA and others for remote testing programs.
- (U) Publish MIL-HDBKs for "EMP Verification Methods" and draft "Guidelines for Preparing Requirements and Specification for Aerospace Systems."
- (U) Support EM test planning and HM/HS program development for B-1 and B-2.
- (U) Continue to develop high power HF direct drive and upgrade large EM system level illuminator (LESLI) to HF capabilities.
- (U) Perform testbed CW experiments for HPM comparison.
- (U) Initiate EM effects hardening support to F-22 program.

Program Element: #0604711F
 PE Title: System Survivability (Nuclear Effects)

Budget Activity: #3 - Strategic Programs

- (U) Evaluate competing HF measurement techniques, continue research in HF EM coupling to systems, and extend development of distributed propagation path simulator.
 - (U) Initiate disturbed environment and jamming mitigation design guidelines.
 - (U) Improve space debris interaction model for improved fracture and failure prediction.
 - (U) Conduct large scale simulation for survivability technology validation/verification.
 - (U) Conduct feasibility study for development of a plasma RF shield technology.
 - (U) Conduct Critical Ionization Velocity experiment on Space Test Program satellite.
 - (U) Complete space radiation environment prediction computer code for program offices.
 - (U) Perform nuclear survivability parameter studies for Minuteman III and Single Reentry Vehicle ICBM.
 - (U) Perform analysis of fallout survivability for mobile communications systems.
 - (U) Develop nuclear criteria, perform ATW parameter study for FEWS.
 - (U) Develop DoD standard for satellite communications in nuclear environments.
 - (U) Continue to develop in-house expertise in ATW effects, support MILSTAR Terminal Working Group, program offices and users, as required.
 - (U) Continue efforts with DNA to update DNA 6500H and develop DOD-STD for satellite communications in nuclear environments.
- (U) FY 1994 Planned Program:
- (U) Support CW test planning and HM/HS program development for B-1 and B-2.
 - (U) Evaluate HPD and UWB effects on aircraft through computer models and tests.
 - (U) Support remote/in-situ coupling experiments and HPRF evaluation of airborne systems.
 - (U) Complete disturbed environment and jamming mitigation design guidelines.
 - (U) Develop design guidelines for kinetic energy resistant spacecraft materials.
 - (U) Update EMP handbooks to include advanced materials and high power HF threat.
 - (U) Upgrade CW and HFRF simulation and instrumentation capability to support HPM system effects experiments.
 - (U) Evaluate HF EM effects on advanced aerospace systems incorporating composite material and highly integrated electronics/fiber optics.
 - (U) Continue comparison of CW response data to alternate sources such as HPM.
 - (U) Conduct final plasma shield laboratory experiments.
 - (U) Complete development of satellite communications in nuclear environments.
 - (U) Transition aircraft measurement technology to Air Force and commercial users.
- (U) Work Performed By: Kaman Sciences Corp., Mission Research Corp., United International Engineering Inc., both in Albuquerque, NM. Managed by the Phillips Laboratory and the Office of Aerospace Studies, Kirtland AFB, NM.
- (U) Related Activities:
- (U) Program Element #0602601F, Advanced Weapons.
 - (U) Program Element #0603438F, Space Systems Survivability.
 - (U) Program Element #0603605F, Advanced Radiation Technology.
 - (U) Program Element #0604747F, EM Test Simulation Facilities.
 - (U) Program Element #0701111F, Airborne and C3I HM/HS.
 - (U) There is no unnecessary duplication of effort within the AF or DoD. The USD(A) has established a joint DoD/Service program to coordinate agency EMP technology efforts. The Defense EMP Standards and Specifications Program gives the AF the responsibility for aircraft standards within DoD.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604727F
PE Title: Joint Standoff Weapons

Project: #1000
Budget Activity: #4 - Tactical Programs

Project Title: Joint Standoff Weapons

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POPULAR NAME: JSOW

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones			Milestone II - Aug 94	Milestone III - 4th Qtr 98
Engineering Milestones			System Functional Review - Jul 94	PDR - Aug 95 CDR - 3rd Qtr 96
T&E Milestones				DT&E - 1st Qtr 96 IOT&E - 4th Qtr 96
Contract Milestones		Pre-EMD May 93	EMD Aug 94	
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	0	4100	17533	109463 (87830)
Support Contract	0	977	3742	15158 (10439)
In-House Support	0	0	0	0 (0)
GFE/Other	0	386	3339	49153 (45428)
Total	0	5463	24614	173774 (143697)

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Program Element: #0604727F
PE Title: Joint Standoff Weapons

Project: #1000
Budget Activity: #4 - Tactical Programs

- B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program provides for integration of the Air Force's BLU-108/B (Sensor Fuzed Weapon submunition) into the Joint Standoff Weapon (JSOW), formerly known as the Advanced Interdiction Weapon System, and development testing with the F-16. Future integration with the F-15E and B-1 is also planned. The Air Force requires a capability to destroy multiple enemy tanks and other armored vehicles during a single aircraft pass with a standoff capability. This need is documented in Mission Need Statement for an Improved Wide Area Capability.
- C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
1. (U) FY 1992 Accomplishments: Not Applicable
 2. (U) FY 1993 Planned Program:
 - (U) Define operational concept, mission planning, aircraft environment, and dispense system
 - (U) Conduct trade studies
 - (U) Start simulations and wind tunnel testing
 - (U) Develop/procure environmental test vehicle
 3. (U) FY 1994 Planned Program:
 - (U) Define aircraft/weapons environment
 - (U) Conduct simulations and continue wind tunnel testing
 - (U) Conduct System Functional Review
 - (U) Conduct test planning
 - (U) Design dispense system, mission planning, and operational flight program
 - (U) Demonstrate dispenser design
 4. (U) Program to Completion:
 - (U) Purchase test vehicles
 - (U) Conduct fit check and electromagnetic compatibility testing
 - (U) Conduct Preliminary Design Review
 - (U) Conduct sled track testing and qualification testing
 - (U) Develop, integrate and validate operational flight program
 - (U) Complete flight certification
 - (U) Conduct Development Test and Evaluation (DT&E)
 - (U) Conduct Initial Operational Test and Evaluation (IOT&E)
- D. (U) Work Performed By: The prime contractor on this program will be the Navy JSOW prime contractor, Texas Instruments of Lewisville, Texas. A supporting contractor will be the F-16 prime contractor, General dynamics of Fort Worth, Texas. Program management is provided by NAVAIR, Conventional Strike Weapons System Program Office, Arlington, Virginia, and the Aeronautical Systems Division, Air-to-Surface Weapons Program Office, Eglin AFB, Florida.
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: None.
 2. (U) SCHEDULE CHANGES: None.
 3. (U) COST CHANGES: Total cost increase of \$11,774,000 due to an updated estimate

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Program Element: #0604727F
PE Title: Joint Standoff Weapons

Project: #1000
Budget Activity: #4 - Tactical Programs

- F. (U) PROGRAM DOCUMENTATION:
(U) Joint Operational Requirement Document (Draft)
(U) Joint Standoff Weapon (JSOW) Acquisition Decision Memorandum (ADM), June 23, 1992
- G. (U) RELATED ACTIVITIES:
(U) Program Element 0604727N, (Joint Standoff Weapon)
(U) Program Element 0604607F, (Wide Area Antiarmor Munition)
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense
- H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands): The procurement of JSOW begins in FY 1998. We are currently in the process of determining the cost of the production program.
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.
- J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
None	None	None

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
T&E activities on this program are in the preliminary planning stage. Exact dates for specific events have not been established.		

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604733F
PE Title: Surface Defense Suppression

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number</u> <u>& Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
3006, AGM-130	20,557	7,722	1,917	947	187,000

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Air Force requires standoff, precision-guided, air-to-surface conventional munitions. These munitions give the Air Force the capability to successfully roll back enemy air defenses and to attack critical high value targets in heavily defended areas. TAF SON 301-86, Short-Range Precision Standoff Surface Attack Weapon, 2 Nov 87, and TAF SORD 301-86-I/II/III-A, AGM-130 (GBU-15 P3I) Short Range Precision Standoff Surface Attack Weapon, 6 Nov 91, both call out the need for the AGM-130. The AGM-130 missile is a pre-planned product improvement to the GBU-15 guided glide bomb. The AGM-130 has a 2000-pound MK 84 blast-fragmentation or BLU-109/B penetrating warhead, TV or imaging infrared (IIR) seeker for day and night missions, and a rocket motor for extended range. The extended range of the AGM-130 reduces delivery aircraft attrition by allowing launch from standoff range, outside target point defenses. The AGM-130, equipped with Improved Data Link (IDL) will also have the capability to attack targets in an electronic countermeasures environment. F-111F and F-15E aircraft will employ the AGM-130. The remaining funds in this program element will complete the weapon software module for the AF Mission Support System to automate and streamline aircrew planning for GBU-15/AGM-130 missions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 3006, GBU-15 P3I:

Integrates AGM-130 with an infrared seeker, with the F-15E, and develops the Improved Data Link (IDL) and the Advanced Support Equipment (ASE) for AGM-130 and GBU-15. FY 1994 effort is primarily mission planning module development and integration for both AGM-130 and GBU-15 with the AF Mission Support System.

(U) FY 1992 Accomplishments:

- (U) Began DT&E of the IDL.
- (U) Continued IIR seeker integration with AGM-130A.
- (U) Continued F-15E/AGM-130 integration.
- (U) Began weapon mission planning efforts for Mission Support System (MSS) IIA.
- (U) Continued development of ASE.

(U) FY 1993 Planned Program

- (U) Complete DT&E and IOT&E and award LRIP on Improved Data Link (IDL).
- (U) Complete DT&E and IOT&E of imaging infrared (IIR) seeker integration.

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Program Element: #0604733F
PE Title: Surface Defense Suppression

Budget Activity: #4 - Tactical
Programs

- (U) Complete F-15E certification for AGM-130A carriage and launch.
- (U) Continue mission planning efforts for Mission Support System (MSS) IIA.
- (U) Complete DT&E and IOT&E on Advanced Support Equipment (ASE).

(U) FY 1994 Planned Program:

- (U) Convert AGM-130/GBU-15 weapon planning software from MSS IIA to the AF Mission Support System (AFMSS).
- (U) Begin testing of weapon mission planning software.
- (U) Complete F-15E integration for AGM-130A.

(U) Work Performed By: The AGM-130 Program Director at the Air-to-Surface Weapons Systems Program Office, Aeronautical Systems Center (ASC), Eglin AFB, FL, manages this program. Contractors are Rockwell International, Duluth, GA (GBU-15 and AGM-130A prime contractor), Harris/Magnavox Systems Company, Melbourne, FL (IDL), and General Dynamics Electronics, San Diego, CA (for the ASE and MSS IIA Mission Support System programs).

(U) Related Activities:

- (U) Program Element #0604327F, Hardened Target Munitions (integration of the AGM-130 with the BLU-109/B warhead).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands):

	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
(U) <u>Aircraft Procurement</u> (BA 7, P-1 Line Item 59)					
Cost	0	19,478	12,821	29,772	62,071
IDL Pod Qty	0	15	22	63	100
(U) <u>Missile Procurement</u> (BA 42, P-1 Line Item 10)					
Cost	72,913	75,264	78,603	1,025,033	1,323,200
AGM-130 Qty	120	102	102	1900	2300
(U) <u>Other Procurement</u> (BA 161, P-1 Line Item 20)					
Cost	0	1,344	6,035	6,447	13,826
ASE Qty	0	0	14*	6	20
*Five retrofits are also included in FY 94 funding.					
(U) <u>Other Procurement</u> (BA 161, P-1 Line Item 20)					
Cost	0	4,995	0	0	4,995
IDL-WDT Qty	0	30	0	0	30

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Program Element: #0604733E
PE Title: Surface Defense Suppression

Budget Activity: #4 - Tactical
Programs

(U) Military Construction: Not applicable.

(U) International Cooperative Agreements: No Current Agreements.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2152 Mission/Engineering Support	4,525	2,412	3,000	Cont	TBD
2286 Tactical Air Forces Range Equipment	5,710	5,388	12,070	Cont	TBD
3320 Strategic Air Command Range Equipment	5,546	1,574	644	Cont	TBD
3321 * EC Test Resources	43,096	39,020	0	N/A	N/A
6510 * Flight Test Threat System Simulators	9,742	4,514	0	N/A	N/A
Total	68,619	52,908	15,714	Cont	TBD

* These two projects were transferred to PE 0604256F, Threat Simulator Development, in FY 94.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Range Improvement Program (RIP) contributes to the survivability of US combat forces by developing range instrumentation systems to increase the effectiveness of training and large-scale exercises. This PE was restructured in FY 94 by transferring the test projects (3321 and 6510) to PE 0604256F.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2152, Mission/Engineering Support: Provides basic operating support, system software acquisition, training requirements collection, consolidation, review and support and systems engineering support such as studies, assessments, and analyses.

(U) FY 1992 Accomplishments:

- (U) Continued RIP basic operating support, systems software acquisition, and systems engineering support.

(U) FY 1993 Planned Program:

- (U) Continue RIP basic operating support, system software acquisition, and systems engineering support.

(U) FY 1994 Planned Program:

- (U) Continue RIP basic operating support, system software acquisition, and systems engineering support.

(U) Work Performed by: This program is managed by the Aeronautical Systems Center, Eglin, AFB FL. The major contractors are Sverdrup Corporation, and RMS Technologies, Fort Walton Beach, FL.

(U) Related Activities: There is no unnecessary duplication of effort in the Air Force or the Department of Defense.

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Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide
Mission Support

(U) Other Appropriation Funds (\$ in Thousands): None.

(U) International Cooperative Agreements: None.

2. (U) Project 2286, Tactical Training Range Equipment: Provides for the development of electronic, telecommunications, and instrumentation equipment/systems for the tactical operational test and training ranges worldwide. These systems provide the vital infrastructure needed to support aircrews in air-to-air, air-to-ground, and electronic warfare combat training and real-time monitoring and control of aircraft during training including the ability to record events for post mission debrief and analysis. The primary developmental efforts include the upgrade to existing instrumentation with the Measurement and Debriefing System (MDS) to allow up to 36 aircraft to participate simultaneously. The Joint Air Combat Training System (JACTS) will replace the current multilateral Red Flag system with the ability to be compatible with Ada and will have a more technically advanced capability which will serve as the baseline for future training range upgrades. The JACTS will provide a training capability compatible with advanced avionics equipment being integrated throughout the Armed Services. It will be capable of supporting tri-Service force packages of up to 100 aircraft simultaneously.

(U) FY 1992 Accomplishments:

- (U) Continued to develop aircraft interface with Air Combat Maneuvering Instrumentation (ACMI) pods and ACMI/MDS software upgrades.
- (U) Continued ACMI software upgrades for Joint Air Force/Army training at the Army's National Training Center, at Fort Irwin, CA.

(U) FY 1993 Planned Program:

- (U) Continue to develop aircraft interface with ACMI pods and ACMI/MDS software upgrades.
- (U) Begin development (through a joint, Navy-led, effort) the Advance Message Oriented Data Security Module (AMODSM), an encryption device between aircraft and ground systems.

(U) FY 1994 Planned Program:

- (U) Continue to develop interoperability improvements and aircraft interface with ACMI pods and ACMI/MDS software upgrades.
- (U) Begin development of the JACTS. Includes design/analysis of system requirements and allocation to the subsystem level; software design/development; interface development for existing government weapon simulations; site surveys; redesign of Government Furnished Equipment and software; design activities related to aircraft interface; and the initiation of prototype pod development.
- (U) Complete development of AMODSM and integrate into JACTS.

(U) Other Appropriation Funds (\$ in Thousands):

- (U) Procurement OPAF/Electronics & Telecommunications Equipment, P-1 Line Item 130.

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Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide
Mission Support

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Aircraft Procurement (PE 0207429F/BP19):					

Funds	7,182	950	8,800	Continuing	TBD
Quantity	N/A	N/A	N/A	N/A	N/A

Other Procurement (PE 0207429F):

Funds	55,164	6,500	23,999	Continuing	TBD
Quantity	N/A	N/A	N/A	N/A	N/A

(U) International Cooperative Agreements: None.

3. (U) Project 3320, Strategic Training Range Equipment: This project provides the capability to evaluate effectiveness of aircrew tactics while operating in a hostile electronic combat environment. The primary effort supports development of an aircrew training system, the Route Integration Instrumentation System (RIIS), to be employed within the existing Tactics Training Route Complex (TTRC). The TTRC/RIIS system will enable realistic combat training at low altitude, in varied terrain, and in an unpredictable threat environment. The Bomber Airborne Instrumentation System (BAIS) will provide a direct aircraft interface with ground systems, enabling more comprehensive aircrew training at the TTRC/RIIS and interaction with the Air Combat Maneuvering Instrumentation (ACMI) ranges developed under Project 2286.

(U) FY 1992 Accomplishments:

- (U) Continued TTRC/RIIS development and range equipment integration. Continued development of BAIS.

(U) FY 1993 Planned Program:

- (U) Continue TTRC/RIIS development and range equipment integration and development of BAIS.

(U) FY 1994 Planned Program:

- (U) Continue BAIS development.

(U) Work Performed by: This program is managed by the Aeronautical Systems Center, Eglin AFB, FL. Major contractors include GTE, Needham, MA (TTRC/RIIS) and Kollsman, Nashua, NH (BAIS).

(U) Related Activities:

- (U) Navy and Army also engage in threat simulator development.
- (U) All USAF requirements for threat simulators and all developments in this project are reviewed by the CROSSBOW-S Committee reporting to the DoD Executive Committee on Threat Simulators (EXCOM).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands):

- (U) Procurement OPAF/Electronics & Telecommunications Equipment, P-1 Line Item 130.

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Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide
Mission Support

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Aircraft Procurement (PE 0101897F/BP19):					
Funds	408	7,600	3,700	Continuing	TBD
Quantity	N/A	N/A	N/A	N/A	N/A
Other Procurement (PE 0101897F):					
Funds	18,765	16,844	11,980	Continuing	TBD
Quantity	N/A	N/A	N/A	N/A	N/A

(U) International Cooperative Agreements: None.

4. (U) Project 6510. Flight Test Threat System Simulators: This project funds the acquisition of threat simulators and advanced signal sources, and the upgrades of existing threat simulators to the current intelligence baseline. This project fills a continuing and expanding need to flight test and evaluate new, and newly modified, electronic combat (EC) equipment prior to production and to periodically verify fielded electronic warfare (EW) systems. This testing is conducted in an open-air environment which more accurately simulates actual combat conditions than can be accomplished using digital models, installed system test facilities, or hardware-in-the-loop facilities. The simulators funded by this project provide this unique capability as an integral part of the EC Test Process.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Continued to modify existing simulators to incorporate latest intelligence information: systems include the SADS V (M), XI, XI (M), VI (M) and IV (R). Acquired advanced signal sources.
- (U) Completed HAVE COPPER ground-based missile system.
- (U) Began development of SA-10 emitter system.
- (U) Developed SA-12 emitter system.

(U) FY 1993 Planned Program:

- (U) Complete work on the SA-10 emitter.
- (U) Continue to modify existing simulators to incorporate the latest intelligence information: systems include the SADS V (Missile), SADS XI, SADS XI (Missile), SADS VI (Missile), and SADS IV (Radar).

(U) FY 1994 Planned Program: See PE 0604256F.

(U) Program Completion: This is a continuing program.

(U) WORK PERFORMED BY: This program is managed by the 46th Test Wing, Eglin AFB, FL. Major contractors are Georgia Institute of Technology, Atlanta, GA; Environmental Research Institute of Michigan; and Dyanetics, Huntsville, AL.

(U) RELATED ACTIVITIES:

- (U) Navy and Army also engage in threat simulator development.
- (U) All USAF requirements for threat simulators, and all developments proposed for inclusion in this project, are reviewed by the CROSSBOW-S Committee

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Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide
Mission Support

reporting to the DoD Executive Committee on Threat Simulators (EXCOM).

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) T&E investments for some new tri-Service common threat simulators are funded in PE 0604940D, Threat Instrumentation Development.

(U) OTHER APPROPRIATION FUNDS (\$ In Thousands): Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

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Program Element: #0604735F
PE Title: Range Improvement

Project Number: 3321
Budget Activity: #6 - Defense-Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Popular Name</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
Electronic Combat Test Resources	43,096	39,020	*	Cont	TBD

* This project transferred to PE 0604256F in FY 94.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and acquires the institutional capabilities necessary to support avionics and electronic combat (EC) test and evaluation (T&E) requirements. Included are digital simulations, Hardware-in-the-Loop (HITL) hybrid facilities, Installed Systems Test Facilities (ISTF), and development of range systems used in test and evaluation. The Joint Modeling and Simulation System (J-MASS) is an Air Force-led, Tri-Service project to develop and demonstrate a DoD-wide common digital simulation architecture in support of test and evaluation. HITL facilities funded by this project are the Air Force Electronic Warfare Evaluation Simulator (AFEWES), the Real-Time Electromagnetic Digitally Controlled Analyzer and Processor (REDCAP), and the Radar Test Facility (RTF) which is used for test and evaluation of fielded and prototype Electronic Counter-Counter Measure (ECCM) capabilities of airborne radar weapons and EC systems. This project also funds the ECCM upgrades of three Eglin AFB facilities: the Pre-Flight Integration of Munitions and Electronic Systems (PRIMES) Facility; the Guided Weapons Evaluation Facility (GWEF); and the Electromagnetic Threat Environment (EMTE) range. Rome Laboratory's Newport, Stockbridge and Verona antenna measurement facilities provide a unique, cost-effective capability within the DoD to evaluate the performance of antennas and systems on full-size aircraft testbeds. This project funds the operation, maintenance and upgrades necessary at these facilities to ensure current and evolving technology systems (e.g., F-22) can be adequately supported. This project also funds the upgrade of the ISTF at Edwards AFB, CA called the Electronic Combat Integrated Test (ECIT) capability. Each of these capabilities is an integral and, therefore, essential part of the EC test process required to meet the test requirements of Air Force weapon systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) J-MASS. Conducted an architecture & SA-12 model integration demo. Began developing additional threat models.
- (U) AFEWES. Continued Multiple Environment Generator (MEG), TWS-10, Reconfigurable Airborne Interceptor (RAI), Infrared Laboratory Expansion (IRLE), and Test Director Set (TDS) projects.
- (U) REDCAP. Continued SUAWACS/Battle Management Command, Control and Communications (BMC3) and facility upgrade projects.
- (U) ECCM. Continue PRIMES and EMTE ECCM upgrades. GWEF initial MMW capability and jamming signal analysis instrumentation.
- (U) Rome Lab. Established F-16 electromagnetic test bed capability. Started F-22 test bed.
- (U) RTF. Completed APG-70 test bench system integration with 4Q92 Initial Operational Capability (IOC). Started three-phased, incrementally funded, Advanced Medium Range Air-to-Air Missile (AMRAAM) Ground Test Unit (GTU) project.

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Program Element: #0604735F
PE Title: Range Improvement

Project Number: 3321
Budget Activity: #6 - Defense-Wide
Mission Support

2. (U) FY 1993 Planned Program:

- (U) AFEWES upgrade. Complete MEG, IRLE and TWS-10 projects. Continue TDS and RAI (renamed Airborne Interceptor Upgrade (AIU)) projects for FY94 completion. Begin Reconfigurable Surface-to-Air Missile (RSAM) project with FY 97 completion.
- (U) REDCAP upgrade. Complete SUAWACS/BMC3 and facility projects for FY94 completion. Initiate Integration of Air Defense Systems (IADS) upgrade. Begin generic link and architecture project.
- (U) ECCM. Continue PRIMES, GWEF, and EMTE upgrade projects. Field two instrumentation upgrades at EMTE.
- (U) Rome Lab. Establish F-22 test bed capability. Complete computer and instrumentation upgrades for Newport and Stockbridge. Complete Newport fiber optics upgrade.
- (U) RTF. Continue AMRAAM GTU project: complete Phase I and initiate Phase II.
- (U) ECIT. Begin development of ECIT capability upgrade.

3. (U) FY 1994 Planned Program: See PE 0604256F.

4. (U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Portions of this project are managed by ASC, Wright-Patterson AFB, OH; 46 Test Wing, Eglin AFB, FL; Rome Laboratory, Griffiss AFB, NY; and the 84 Test Squadron, Tyndall AFB, FL. Major contractors include Lockheed Corporation, Fort Worth, TX (AFEWES); Calspan Corporation, Buffalo, NY (REDCAP); Hughes Aircraft Corporation, Los Angeles, CA; Georgia Tech Research Institute, Atlanta, GA, and Rome Research Corp., Rome, NY.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: See PE 0604735F.
2. (U) SCHEDULE CHANGES: See PE 0604735F.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 3-79, 20 Jun 80
- (U) SAC SON 08-81, 28 Jul 82
- (U) AFSC SON 004-89, 6 Dec 89

G. (U) RELATED ACTIVITIES:

- (U) Navy and Army also engage in electronic combat T&E infrastructure development programs.
- (U) All USAF threat simulator programs, including portions of this project are reviewed by the CROSSBOW-S Committee and the DoD Executive Committee on Threat Simulators (EXCOM).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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Program Element: #0604735F
PE Title: Range Improvement

Project Number: 3321
Budget Activity: #6 - Defense-Wide
Mission Support

- H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands): Not Applicable.
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.
- J. (U) MILESTONE SCHEDULE: See PE 0604735F.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0604740F
 PE Title: Computer Resource
Technology Transition (CRTT)

Budget Activity: #4-Tactical Programs

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 92</u> <u>Actual</u>	<u>FY 93</u> <u>EST</u>	<u>FY 94</u> <u>EST</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2522 Advanced Comp Tech Trans	3,985	2,376	2,764	Cont	TBD
2523 Architectural Implementation	2,350	1,913	1,918	Cont	TBD
2524 Reuse and Component Sup	9,401	9,957	0	Cont	TBD
2525 Critical Software Research	0	3,348	0	Cont	TBD
3315 Digital Info Tech Trans	<u>1,954</u>	<u>2,868</u>	<u>2,455</u>	<u>Cont</u>	<u>TBD</u>
<u>Total</u>	17,690	20,462	7,137	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The name has been changed from Computer Resources Management Technology (CRMT) to Computer Resource Technology Transition (CRTT) to more properly reflect an engineering development program that transitions technology into operational Air Force organizations. Specifically, the CRTT program addresses problems of acquiring, developing, and supporting emerging computer resources. The goal of this program is to reduce software lifecycle costs and to improve the quality of computer systems development and support. This is the only Air Force program for transitioning software technology across the board into the USAF (rather than into a specific acquisition program).

(U) The program consists of five major projects. Project 2522 will establish the foundational elements of an effective methodology to support technology transition efforts program-wide and will provide for implementation of technology receptor groups and development of methodology to support transitioned capability. Project 2523 will initially address a particular instantiation, namely command and control architectures, of reusable technology which are available or can be developed in the near term. The task will also support the development through rapid prototyping and interaction with Air Force users, a generic architecture for support of command and control center applications. Project 2524 is a Congressional special interest item and will address the technologies/processes inherent in operating and maintaining a domain central repository of software, software algorithms, and reusable technologies. A domain specific reuse repository will be established for the process. A second repository will be set up to verify them. Project 2525 is a Congressional special interest item that will address research on software reliability for critical systems. Project 3315 will provide a totally integrated capability to create, accept, retrieve and store digital (paperless) technical information for life cycle support for Air Force logistics.

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Program Element: 0604740F
PE Title: Computer Resource
Technology Transition (CRTT)

Budget Activity: #4-Tactical Programs

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project 2522. Advanced Computer Technology Transition: Specific emphasis will be placed on accelerating technology transition by implementing technology receptor groups at MAJCOM, with responsibility for coordinating and directing continuous process improvement efforts at the each MAJCOM. The receptor groups, with support from the CRTT program office, will identify problem areas affecting computer technology use/support and act as the liaison between the MAJCOM and technology producers. This project is needed to transition software technology into the operational Air Force.

(U) FY 1992 Accomplishments:

- (U) Completed software process action team (PAT) study that defined root causes/developed solutions to improve the acquisition process for mission critical computers.
- (U) Continued funding the Joint Logistics Commanders (JLC) efforts to implement joint software standards.
- (U) User-interface prototype developed for the Enhanced-Software Lifecycle Support Environment (E-SLCSE). Initiated tool productization.
- (U) Began Ada9X compiler development to use as next generation Ada language.
- (U) Transitioned optical archiving system to the Air Staff.

(U) FY 1993 Planned Program:

- (U) Develop a technology insertion/transition infrastructure within the Air Force.
- (U) Continue funding JLC activities in software re engineering and modernization of obsolescent, expensive software.
- (U) Transfer E-SLCSE to three Air Force organizations.
- (U) Continue developing Ada9X compiler.
- (U) Transition software process improvement methods into Air Force software Central Design Activities (CDAs).

(U) FY 1994 Planned Program:

- (U) Continue to develop technology transition infrastructure within the Air Force.
- (U) Continue E-SLCSE productization/technology transition.
- (U) Complete transition of Ada9X.
- (U) Continue transitioning software process improvement methods into Air Force software Central Design Activities (CDAs).

(U) WORK PERFORMED BY: Work is performed by International Software Systems, Intermetrics, Mosaic, Horizon's Technology and the Software Engineering Institute.

(U) RELATED ACTIVITIES: The following Air Force programs offer broad-based technology solutions:

- Program Element #0603728F, Advanced Computer Technology
 - Program Element #0603752F, DoD Software Engineering Institute
- There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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Program Element: 0604740F
PE Title: Computer Resource
Technology Transition (CRTT)

Budget Activity: #4-Tactical Programs

2. (U) Project 2523, Architectural Implementation: Develop, through rapid prototyping and interaction with Air Force users, a generic architecture for support of command and control applications. The architecture will address the components common to most command centers (e.g., message processing, display processing, user interfaces) and will focus on the migration of multilevel computer security applications/technologies into AF operations. This project is needed to mitigate development time associated with command center acquisitions so that the system is not obsolete when delivered.

(U) FY 1992 Accomplishments:

- (U) Awarded multi-year contract to develop generic command centers.
- (U) Initiated domain analysis for command centers.
- (U) Initiated methodology to qualify reusable software components.
- (U) Identified multilevel security issues and solutions.
- (U) Continued Security Products (SecurityPro) program task (testing, analysis and technology transition of commercial computer security products).
- (U) Demonstrated initial system capabilities to DoD organizations.

(U) FY 1993 Planned Program:

- (U) Complete domain analysis for command centers.
- (U) Continue evolving generic command center architecture.
- (U) Continue methodology to qualify software components.
- (U) Continue identifying multilevel security issues/solutions.
- (U) Continue the SecurityPro/Transition Analysis Facility (STAF) testing, analysis and technology transition.
- (U) Establish interface to other software repositories.
- (U) Demonstrate generic command center capability.
- (U) Provide rapid prototyping services to users/program offices.

(U) FY 1994 Planned Program:

- (U) Update generic command center architecture.
- (U) Complete methodology to qualify software components.
- (U) Continue identifying multilevel security issues/solutions.
- (U) Continue STAF testing, analysis and technology transition.
- (U) Provide environment to facilitate procurement, integration, and implementation of timely, cost effective, maintainable command center systems.

(U) WORK PERFORMED BY: Work is performed by Raytheon and Hughes Aircraft.

(U) RELATED ACTIVITIES: The following Air Force programs offer broad-based technology solutions:

- Program Element #0303401F, Communications Security
- There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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Program Element: 0604740F
PE Title: Computer Resource
Technology Transition (CRTT)

Budget Activity: #4-Tactical Programs

3. (U) Project 2524. Reuse and Reusable Component Support: Develop a documented knowledge for establishing software reuse libraries that support specific application domains. These libraries will support system engineers through the reuse of large scale software components. This program is needed so that the Air Force can reuse software that it has already purchased by developing a central repository of software and software algorithms. Reusing software will result in lower software development costs, faster software development schedules, and lower software development risks.

(U) FY 1992 Accomplishments:

- (U) Populated prototype library with minimal set of programs.
- (U) Completed reuse blueprint for DoD.
- (U) Selected a second (mission critical) domain to test blueprint.
- (U) Expanded library functionality.
- (U) Completed draft user's manual and library operations manual.

(U) FY 1993 Planned Program:

- (U) Demonstrate Interoperability to other reuse libraries.
- (U) Apply blueprint to other domains.
- (U) Provide support and training to the second domain.
- (U) Continue to populate library with software artifacts.

(U) FY 1994 Planned Program:

- (U) Provide knowledge to others on establishing libraries.
- (U) Support Domain Specific Prototyping.
- (U) Initial transition of blueprint to DoD.
- (U) Continue to populate library with software artifacts.

(U) WORK PERFORMED BY: Work is performed by PARAMAX, DSD Laboratories, Azimuth Inc., D.N. American, Galaxy Global Corp., and EWA.

(U) RELATED ACTIVITIES: Not Applicable.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

4. (U) Project 2525. Critical Software Research:

(U) FY 1992 Accomplishments:

- (U) None, FY93 Congressional special interest item.

(U) FY 1993 Planned Program:

- (U) Proof-of-concept experiment of an alternate method of developing software.
- (U) Develop a message translation and validation software application.
- (U) Develop needed tools for new software design method.
- (U) Develop transition plan for Air Force use.

(U) FY 1994 Planned Program:

- (U) None, FY93 Congressional special interest item.

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Program Element: 0604740F
PE Title: Computer Resource
Technology Transition (CRTT)

Budget Activity: #4-Tactical Programs

(U) WORK PERFORMED BY: Work is performed by Pacific Software Research Center, Oregon Graduate Institute and Draper Labs.

(U) RELATED ACTIVITIES: Not Applicable.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

5. (U) Project 3315, Digital Information Technology Transition: DOD Defense Guidance and Office of the Secretary of Defense (OSD) funding initiatives have emphasized the need to improve the preparation, delivery, use and updating of digital technical information used in the design, manufacture, maintenance, and operation of DOD weapon systems. This project is needed to transition from a paper-intensive weapon system acquisition and support process to a largely automated and integrated mode of operations. This will allow the Air Force to create data once and use it many times.

(U) FY 1992 Accomplishments:

- (U) Start-up of the Air Force CALS Roadmap.
- (U) Supported Air Force portion of CALS EXPO 92.
- (U) Provided Air Force support to Defense CALS Executive Office.
- (U) Developed CALS training plan and 2 week course.
- (U) Initiated specification for designing electronic technical manuals.
- (U) Assisted the paperless acquisition initiative start-up as a program office.
- (U) AF support for Ada based environment for test (ABET) which will automate and integrate test system technical information at AF depots.

(U) FY 1993 PLANNED PROGRAM:

- (U) Develop Air Force CALS Implementation Plan.
- (U) Update Air Force CALS architecture.
- (U) Plan and execute CALS EXPO 93.
- (U) Continue development of technical standards/specifications.
- (U) Artificial intelligence applications for specifications/standards.
- (U) Continue paperless acquisition effort.
- (U) AF support for ABET.

(U) FY 1994 PLANNED PROGRAM:

- (U) Implementation of Air Force CALS planning and architecture.
- (U) Continue development of technical standards/specifications.
- (U) Plan and execute CALS EXPO 94.
- (U) Develop test cases for AF infrastructure to implement CALS.
- (U) Continue paperless acquisition effort.

(U) WORK PERFORMED BY: Work is performed by TRW Inc. and RJO Enterprises.

(U) RELATED ACTIVITIES: Not Applicable.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604750E
 PE Title: Intelligence Equipment

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES: (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
2053 Foreign Aerospace Science & Technology Center Intelligence Processes	<u>2,919</u>	<u>2,853</u>	<u>2,875</u>	<u>Continuing</u>	<u>N/A</u>
TOTAL	2,919	2,853	2,875	Continuing	N/A

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element supports USAF operating commands by performing the engineering development of ground equipment and/or techniques to streamline the processing, integration, display and distribution of intelligence data. Developed software will reduce the time required for the exploitation of intelligence data by Air Force agencies producing strategic, tactical, and scientific and technical intelligence products. Equipment and techniques are also developed to counter the foreign intelligence threat to the USAF mission.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

(U) Project 2053. Foreign Aerospace Science & Technology Center (FASTC) Intelligence Processes:
 FASTC's mission is to acquire, evaluate, analyze and report on foreign scientific and technological progress in response to Department of Defense/Defense Intelligence Agency tasking. The advent of

This project improves the FASTC capability to acquire, evaluate, analyze, and report on foreign scientific and technical information and material and to provide timely and accurate threat assessments of foreign weapon system technology. These improvements will assist in responding to intelligence requirements vital to operational commanders, research and development planners, and national level agencies.

(U) FY 1992 Accomplishments:

- (U) Completed technology transition of Advanced Systematic Analysis Production III (ASAP III) to FASTC.
- (U) Transitioned Space Based Particle Beam Weapon Modeling to FASTC.
- (U) Initiated Bomber Penetration II, an enhanced simulation of foreign bomber, interceptor & tanker tactics.
- (U) Initiated Low Observable Design Synthesis Tool
- (U) Initiated ECM Techniques Modeling Enhancements
- (U) Initiated IR Flare Performance Model

(U) FY 1993 Planned Program:

- (U) Complete ELINT Expert TUTOR.
- (U) Complete Ground Attack Fighter Model.
- (U) Complete Communications Network Model.

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Program Element: #0604750E
PE Title: Intelligence Equipment

Budget Activity: #4 - Tactical Programs

- (U) Complete Electromagnetic Antennae Model.
- (U) Initiate Computer Aided Engineering Design Model.
- (U) Initiate Infrared Signature Modeling.
- (U) Initiate RF Weapons Modeling.

(U) FY 1994 Planned Program:

- (U) Complete Bomber Penetration II.
- (U) Transition Low Observable Design Synthesis Tool.
- (U) Finalize ECM Techniques Modeling.
- (U) Transition IR Flare Performance Model.

(U) Work Performed By: Martin Marietta, Orlando FL; Rockwell Power Services,
Albuquerque, NM; HRB Systems, State College, PA.

(U) Related Activities: PE 0301310F (FASTC).

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604754F Project: # P771
PE Title: Joint Tactical Information Budget Activity: #4-Tactical Programs
Distribution System (JTIDS)

Project Title: Joint Tactical Information Distribution System

[illegible]

POPULAR NAME: JTIDS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands)

SCHEDULE	FY 1992	FY 1993	FY 1994	(To Complete)
Program Milestones			III CLS 2/ 2H February	
Engineering Milestones	PCA (A/F Config)	FCA (F-15)		
	September	January		
T&E Milestones	AF/Navy Joint OT&E September	Army/AF Joint OT&E August		
Contract Milestones	Lot 3 Production September	Lot 4 Production May	Full Rate Production May	Complete AF Buy
BUDGET (\$000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	9,501	5,141	6,568	458,300 (58,123)
Support Contract	3,243	2,460	2,404	94,600 (13,129)
In-House Support	2,325	5,649	2,209	15,500 (1,720)
GFE/ Other	346	1,890	700	9,200 (3,686)
Total	15,415	15,140	11,881	577,600 (76,658)

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Program Element: #0604754F Project: # P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The objective of this program is to provide command and control of air defense resources, and pilot situational awareness, avoiding fratricide and dual targeting. It is a highly jam resistant, secure digital information distribution system for use in a tactical combat environment. The Joint Tactical Information Distribution System (JTIDS) is a joint development employing Time Division Multiple Access (TDMA), and spread spectrum techniques. The system will permit rapid and secure exchange of essential command, control, and status information among all terminals in the tactical theater.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:
 - (U) Achieved 400 hour (Lab) mean-time-between failure (MTBF) for Class 2H (High Power Terminal).
 - (U) Awarded contract for Production Improvement Phase 2, Common Signal Processor and associated software.
 - (U) Continued system integration and software development for Airborne Battlefield Command and Control Center (ABCCC) and Modular Control Equipment (MCE).
 - (U) Accepted delivery of Low Rate Initial Production (LRIP) Lot 1 Class 2 production terminals.
 - (U) Continued development of common software for Joint Service terminals.
 - (U) Awarded contract for follow-on development work (software upgrades).
 - (U) Awarded contract for LRIP Lot 3 (Navy) production.
 - (U) Conducted joint Air Force/Navy Operational Test and Evaluation (OT&E).
 - (U) Obtained expanded spectrum certification.
 - (U) Procurement of MCE terminals was not funded at this time.
2. (U) FY 1993 Planned Program:
 - (U) Start final retarget of all software to Common Central Processing Unit (CPU).
 - (U) Redirected ILSE resources to complete Built In Test (BIT) for the Class 2/2H terminals to support the Air Force two level maintenance concept.
 - (U) Conduct joint Air Force/Army OT&E.
 - (U) Award contract for LRIP Lot 4 (Navy, MCE, E-3, and E-8) production.
 - (U) Accept delivery of LRIP Lot 2 (Navy and E-3) terminals.
 - (U) Achieve 500 hour (Lab) MTBF for Class 2/2H and Ship terminals.
 - (U) Support Operational Utility Evaluation (OUE) of tactical data links.
 - (U) Under the Low Cost Data Link (LCDL) initiative, investigate new technologies for evolving a low cost, compact, highly reliable, and low power TADIL-J terminal using commercial components..
3. (U) FY 1994 Planned Program:
 - (U) Accept delivery of LRIP Lot 3 (Navy) terminals.
 - (U) Complete Full Rate Production Decision.
 - (U) Award Full Rate Production Contract for Navy, E-3, E-8, and Army terminals.
 - (U) Continue new technology efforts.
 - (U) Add Time Slot Reallocation (TSR) function to common network interface computer program.
 - (U) Retrofit of all terminals with product improvement hardware and software.

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Program Element: #0604754F

Project: # P771

PE Title: Joint Tactical Information
Distribution System (JTIDS)

Budget Activity: #4-Tactical Programs

- (U) Complete final retarget of all software to Common CPU.
- (U) Complete support to OUE flight test.
- (U) Award contract for LCDL advanced technology transition demonstration.

4. (U) Program to Completion:

- (U) Accept delivery of Lot 4 terminals.
- (U) Complete activation of hardware depot and Centralized Software Support Activity (CSSA)/Interface Software Support Activity (ISSA) depots.
- (U) Continue interoperability support.
- (U) Complete procurement of all Air Force terminals.
- (U) Complete testing and integration with Air Force platforms.

D. (U) WORK PERFORMED BY: The Joint Program Office is located at the Electronic Systems Center, Hanscom AFB, MA. Work is also being done at the Aeronautical Systems Center, Wright-Patterson AFB, OH; and the Electromagnetic Compatibility Analysis Center (ECAC), Annapolis, MD. Major contractors are: GEC-Marconi Electronic Systems Corp. (formerly Plessey Electronic Systems Corp) (Class 2 terminal lead developer), Wayne, NJ; Rockwell-Collins (Class 2 terminal follower), Cedar Rapids, IA; Boeing Aerospace Company (E-3 integration), Seattle, WA; Grumman Melbourne Systems Division (JSTARS integration), Melbourne, FL; Litton Data Systems (MCE integration), Van Nuys, CA; McDonnell Douglas Aircraft Corporation (F-15 integration), St Louis, MO; and MITRE Corporation (systems engineering), Bedford, MA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: N/A

2. (U) SCHEDULE CHANGES: Milestone III slipped 3 months because of a change in Navy ship schedules and assets required to complete testing were not available.

3. (U) COST CHANGES: N/A

F. (U) PROGRAM DOCUMENTATION:

- (U) Tactical Air Forces Statement of Operational Need (TAF SON) 703-73, November 1973
- (U) JTIDS System Operations Concept (SOC), 15 March 1987
- (U) Decision Coordinating Paper (DCP, 6 June 1989
- (U) Joint Integrated Logistics Support Plan, 3 July 1990
- (U) Multiple Required Operational Capability (MROC) MJCS-194-89, 16 August 1989
- (U) JTIDS Program Baseline, 10 July 1991
- (U) Acquisition Decision Memorandum, 11 October 1989
- (U) System Operational Requirements Document (SORD), TAF-306-74-I/II/III-A, 8 November 1991
- (U) Test and Evaluation Master Plan (TEMP), 16 February 1993.

G. (U) RELATED ACTIVITIES:

- (U) Program Element #27130F F-15
- (U) Program Element #64770F E-8 (Joint STARS)
- (U) Program Element #27417F E-3 (AWACS)
- (U) Program Element #27412F Tactical Airborne Command & Control System
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.
- (U) Joint Program Designator (JPD) to be determined at Milestone III.

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Program Element: #0604754F Project: # P771
 PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

- (U) Procurement APAF E-3 BA-05, P-48/BA-06, P-55:

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	-0-	14,700	-0-	94,600	109,300

- (U) Procurement APAF E-8 BA-06, P-55

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	-0-	5,300	6,000	26,900	38,200

- (U) Procurement OPAF MCE BA-06, P-55

	FY 1992 <u>Actual</u>	FY 1993 <u>Estimate</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	-0-	27,100	-0-	16,200	43,300

- (U) MILITARY CONSTRUCTION: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Memorandum of Understanding (MOU) between the UK and US Government is in effect and under review by the UK and US Government. The UK is purchasing JTIDS terminals both through direct commercial contract and through FMS procedures.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
Pre-DAB DT/OA	1/89 - 5/89	Resolved test issues to support LRIP
JSTARS 1st JTIDS Flt.	1/90	Successful data transfer
TEMP	11/90	OSD & Services approved
Navy DT-IID	7/90 - 9/90	Successfully comp. NAVY DT&E for Lot 2
Navy OT-IIA	10/90	Successfully comp. Lot 2 Exit Criteria
Post DAB phase 1 DT/OT	9/90	Successfully passed data between AF & Navy platforms (position & surveillance)
Army 2M Tech. test	6/90 - 3/91	Completed 2M terminal technical testing
Navy DT-IIIE	6/91 - 2/92	Started Navy testing to support Lot 3
Joint AF/Navy OT&E #1	9/91 - 10/91	MS test to support Lot 3 Exit Criteria
Joint AF/Navy OT&E #2	6/92	AF/Navy interoperability in an EW environment - supports M/S III.

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
Multi-service OT #3	8/93	AF/Army interoperability in an EW environment - supports M/S III.
Joint AF/Army OT&E	8/93	AF/Army interoperability - supports M/S III.
OUE	12/94	Complete evaluation flights and report results.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759F
PE Title: Major T&E Investment

Budget Activity: #6 - Defense-wide
Mission Support

A. (U) RESOURCES (\$ in Thousands):

Project Number & Title	FY 1992 *Actual	FY 1993 *Estimate	FY 1994 Estimate	To Complete	Total Program
2880 4950th Test Wing	3,476	2,174	**	-	-
3120 Air Force Development Test Center (AFDTC)	14,165	17,453	12,710	Cont	TBD
3285 Arnold Engineering Development Center (AEDC)	7,762	11,516	12,121	Cont	TBD
3323 Cruise Missile Mission Control Aircraft (CMMCA)	132	2,200	1,400	0	0
3324 HAVE LINK	899	801	***	-	-
3620 Air Force Flight Test Center (AFFTC)	20,525	17,239	28,491	Cont	TBD
4282 Developmental Manufacturing and Modification Facility (DMMF)			1,076	Cont	TBD
Total	46,959	51,383	55,798	Cont	TBD

* FY93 and prior funded in PE 64755F. As a result of the FY94 OSD Program Budget Decision review, the title of this PE was changed from "Improved Capability for DT&E" to the current title.

** Transferred to AFFTC project 3620 and DMMF project 4282.

*** Included in individual centers budgets.

NOTE: This is one of several Air Force Test Infrastructure accounts which provides direct support to the DOD test mission. The aggregate FY94 budget for these accounts reflects a significant negative real growth since 1968. As a result, weapon system technology advancements have occurred during this time period without the investment in the test infrastructure to support the advanced test capability requirements.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program ensures that the test and evaluation technology at Air Force test locations, as part of the Department of Defense (DOD) Major Range and Test Facilities Base (MRTFB), is compatible with the systems they are required to test. This program provides planning, improvements, and modernization for test capabilities at four (three starting in FY94 as the 4950TW transfers to AFFTC) MRTFB locations (4950TW, AEDC, AFFTC, and AFDTC). When the 4950TW effort transfers to BPAC 3620 (AFFTC), the Developmental Manufacturing and Modification Facility (DMMF) mission will remain at Wright-Patterson AFB under BPAC 4285. The fluctuations in the funding at these locations are the result of changing priorities in the improvement and modernization requirements as defined through the AF Test Investment Planning & Programming (TIPP) process and documented in the Air Force Test Investment Strategic Plan (TISP). Also, all projects have been reviewed through the tri-Service Reliance effort (to communicate Air Force efforts to the other services and avoid unwarranted duplication of effort) and are documented in the Test Capability Master Plans (TCMP). Further, each specific project has its own planning, development, equipment acquisition/facility construction, equipment installation, and checkout phases which often requires significant differences in funding from one year to the next. As such, the changes in funding from year to year do not necessarily indicate program growth but rather a planned phasing of improvement and modernization efforts. The test capabilities at these centers enable testing through all phases of weapon system acquisition from system concept exploration through component and full scale integrated weapon system testing to operational testing. These four test centers have over \$10B

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worth of unique test facilities/capabilities. They are a national asset operated and maintained by the Air Force for DOD test and evaluation missions, but they are available to others having a requirement for their unique capabilities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Project: 2880. 4950th Test Wing: The 4950TW, Aeronautical Systems Center, Wright-Patterson AFB, OH, performs flight testing of aircraft and airborne systems and supports space vehicle tracking for the AF, other DOD agencies, and NASA. Staging out of the US and overseas bases, the Advanced Range Instrumentation Aircraft (ARIA) provide telemetry support for NASA and DOD missile launches. The Cruise Missile Mission Control Aircraft (CMMCA) will support cruise missile and RPV testing. The CMMCA project funds development of critical Software Development System (SDS) and spares necessary for initial maintenance of CMMCA aircraft. The Integrated Data Facility (IDF) consists of a ground-based laboratory module, a real-time test data monitoring module, and a module for improved data computation and analysis. The IDF enables secure data processing and software modifications necessary for conduct of ARIA, CMMCA, and Advanced Radar Test Bed (ARTB) missions. IDF is the link between the 4950TW aircraft and the host base data processing system; therefore, the completed IDF will move to Edwards AFB to help beddown the 4950TW aircraft. ARIA Scoring Systems aircraft modification, which includes the Sonobuoy Missile Impact Location System (SMILS), an optical tracking system, and the Meteorological Evaluation Test System (METS) will enable accurate measurements of DOD missile launches as well as precise determination of reentry vehicle impact position/time during ballistic missile testing.

(U) FY 1992 Accomplishments:

- (U) Continued Integrated Data Facility (IDF) program with the real time test data monitoring module. The classified processing vault and Local Area Network became operational and the telemetry system was updated with an encryption capability. (\$3.0M)
- (U) Completed Advanced Range Instrumentation Aircraft (ARIA) Scoring Systems aircraft flight testing. (\$0.5M)

(U) FY 1993 Planned Program:

- (U) Complete IDF and SMILS program necessary to prepare for move and integration at Edwards AFB. (\$1.6M)
- (U) Install equipment and begin ground testing of aircraft to support Cruise Missile Mission Control Aircraft (CMMCA) test program. (\$0.6M)

(U) FY 1994 Planned Program:

- (U) Transfer of the 4950TW to AFFTC scheduled to begin in FY94. Only remaining effort will be associated with the Developmental Manufacturing and Modification Facility (DMMF) remaining at Wright-Patterson AFB, OH.

(U) Work Performed By: Chrysler Technologies Airborne Systems, Inc., Waco, TX.

- (U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.

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(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 3323, Cruise Missile Mission Control Aircraft (CMMCA): The CMMCA will consolidate telemetry support, mission control functions, radar safety chase, and flight following capabilities into a single airborne platform. As such, CMMCA will replace visual safety chase for most cruise missile test missions resulting in significant savings.

(U) FY 1992 Accomplishments:

- (U) Conducted system level flight testing on aircraft #893. Program reevaluation initiated as a result of radome and radar problems.
- (U) Sent aircraft #893 to Programmed Depot Maintenance (PDM) and began installation of mission equipment in aircraft #895.

(U) FY 1993 Planned Program:

- (U) Complete PDM on aircraft #893; reinstall and checkout equipment.
- (U) Complete equipment installation and ground test of aircraft #895.
- (U) Conduct system flight test on aircraft #893 and air worthiness flight test on aircraft #893.

(U) FY 1994 Planned Program:

- (U) Conduct final systems flight testing and deliver aircraft #893 (IOC) and aircraft #895 (FOC).

(U) Work Performed By: Chrysler Technologies Airborne Inc., Waco, TX.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project: 3324, HAVE LINK: The Air Force HAVE LINK program implements Office of the Secretary of Defense direction to increase operational security on sensitive unclassified information and test data on test ranges. The HAVE LINK program implements corrective measures to eliminate identified vulnerabilities subject to exploitation by hostile intelligence collection agencies.

(U) FY 1992 Accomplishments:

- (U) AEDC: Completed development of Unclassified Data Control Network (UDCN) with installations in fourth satellite building. (\$0.2M)
- (U) AFDTTC: Procured encryption devices for microwave systems. (\$0.3M)
- (U) AFFTC: Continued network security upgrade, land radio procurement, and range telemetry upgrade. (\$0.4M)

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(U) FY 1993 Planned Program:

- (U) 4950TW: Complete installation of UHF Secure SATCOM equipment on ARIA aircraft. (\$0.8M)

(U) FY 1994 Planned Program:

- (U) This project has essentially achieved the macro-level OSD objectives and the remaining efforts are evolving into relatively small, incremental upgrades to security equipment. As such, they are being transferred to the individual test locations.

(U) Worked Performed By: Digital Equipment Corporation, Pittsburgh, PA; Motorola, Inc., Scottsdale, AZ; Dorne & Margolin, Inc., Bohemia, NY; Mykotronix LA, CA; Andrew Corp., Orland Park, IL; various GSA vendors; and AFFTC, AEDC, and AFDTTC in-house resources.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project: 4282. Developmental Manufacturing and Modification Facility (DMMF): The Developmental Manufacturing and Modification Facility (DMMF) provides fabrication and aircraft modifications support to test centers and ranges. Previously, this effort was included as part of the 4950 TW project. Increased requirements for improvement in this capability and the move of 4950 TW move to AFFTC has prompted establishment of this effort as a separate project.

(U) FY 1992 and FY 1993 Planned Program: Not applicable. (This effort was previously included in the 4950th Test Wing budget).

(U) FY 1994 Planned Program:

- (U) Procure hardware, software, peripherals, networks, and contractual services such as analysis, integration, training, maintenance, and documentation for the Computer Integrated Manufacturing (CIM) program. (\$0.25M)
- (U) Continue CAE workstation modernization. (\$0.45M)
- (U) Upgrade manufacturing machines and interface with information infrastructure to support digital and voice communications and computer application for business, program and technical support. Procure Computer Numerically Controlled equipment to support work in composite, non-metal, and metal aircraft components. (\$0.4M)

(U) Work Performed By: In house work force.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Project Number: 3285
 Budget Activity: #6 - Defense-wide
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A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
3285 Arnold Engineering Development Center (AEDC)	7,762	11,516	12,121	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: AEDC, Arnold AFB, TN, provides ground environmental test support for DOD aeronautical, missile, and space programs. The center has 23 active test cells providing: aerodynamic testing of scale model aircraft, missile, and space systems; testing of large and full-scale satellites, sensors, and space vehicles in a simulated space environment; altitude environmental testing for aircraft, missile, and spacecraft propulsion systems and testing of large-scale models such as space boosters together with their propulsion systems. The Large Rocket Test Facility (J-6) will enable safe testing of solid propellant rocket motors at simulated altitude conditions. MILCON funding provides for construction while funds in this project provide for the testing and activation of the actual J-6 facility. The T-3 Engine Test Cell modification program will enable testing of next generation cruise missile engines through the upgrade of existing capabilities. The Improved Ballistic Range program provides critical soft launch ballistic capability. The C-Cell Data Acquisition and Processing System provides processing capability for advanced turbine engine testing on programs such as F-22 and NASP. The current system is available only part of the time due to frequent breakdown/non-availability of spare parts. This results in increased program costs and schedule delays. The Test Unit Support Systems (TUSS) project replaces antiquated control systems with automatic control systems in jet engine and rocket engine test facilities to improve efficiency. Starting in FY94, the Engine Test Facility will be upgraded to support fighter engine testing and the J-4 rocket test cell will be upgraded to support liquid rocket motor testing.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued J-6 project support in technical/management oversight of construction, support to construction contractor, base support services, Management Information System (MIS) operations/maintenance, and review of activation/validation resource requirements. (\$1.4M)
- (U) Initiated C-Cell Data Acquisition and Processing System with work station initial planning/design effort. (\$0.4M)
- (U) Began TUSS project with control systems acquisition and installation in jet engine test cell. (\$1.0M)
- (U) Continued Improved Ballistic Range project upgrade with equipment acquisition/fabrication of new launchers. (\$5.0M)

2. (U) FY 1993 Planned Program:

- (U) Continue J-6 project support in technical and management oversight of construction, technical support to construction contractor, base support services, MIS operations and maintenance, and review of activation/validation resource requirements. Additionally, activation/validation planning will begin leading to IOC in FY95. (\$3.4M)
- (U) Continue C-Cell Data Acquisition and Processing System with acquisition/installation of work stations and data processors. (\$3.1M)

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- (U) Continue TUSS project with control systems acquisition and installation in wind tunnel. (\$0.9M)
- (U) IOC of Improved Ballistic Range project upgrade with fabrication and initial installation of equipment. (\$4.1M)

3. (U) FY 1994 Planned Program:

- (U) Continue J-6 project support in technical and management oversight of construction, technical support to construction contractor, base support services, and MIS operations and maintenance. Continue site activation/validation. (\$4.1M)
- (U) Continue C-Cell Data Acquisition and Processing System with installation of additional work stations/processors. The capability will support all tri-Service large turbine engine development testing as agreed to by the OSD Test Reliance effort. (\$3.4M)
- (U) Continue TUSS project with control systems acquisition and installation in wind tunnel. (\$1.5M)
- (U) Begin integration of CAD/CAM with manufacturing and measurement equipment. (\$1.2M)
- (U) Begin upgrade of Engine Test Facility (ETF) to support fighter aircraft advanced engines by providing unique national capability to test axi-symmetrical exhaust nozzles at simulated flight conditions. This upgrade will also increase the thrust rating of the propulsion cell, allowing these more economical cells to be used to support all tri-Service large turbine engine development testing. (\$0.33M)
- (U) Begin study of existing test capabilities used for weather/erosion testing of radomes/seeker materials to identify areas that require optimization. (\$0.1M)
- (U) Begin design and upgrade of J-4 rocket test stand to restore this nation's only continuous altitude simulation test capability to support medium thrust liquid rocket motor testing. (\$1.5M)

4. (U) Program to Completion: This is a continuing project.

D. (U) WORK PERFORMED BY: Calspan Field Services, Inc., Buffalo, NY and AEDC in-house resources.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable.
2. (U) Schedule Changes: Not Applicable.
3. (U) Cost Changes: Not Applicable.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(6)/0604755F, Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:

- (U) PE 0604940D, Test Instrumentation Development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.

H. (U) OTHER APPROPRIATION FUNDS:

	FY 1992	FY 1993	FY 1994	To	Total
	Actual	Estimate	Estimate	Complete	Program
MILCON	\$80M	0	0	0	\$226M

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: This is a continuing project.

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Project Number: 3120
Budget Activity: #6 - Defense-wide
Mission Support

A. (U) RESOURCES (\$ in Thousands):

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
3120 Air Force Development Test Center (AFDTC)	14,165	17,453	12,710	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AFDTC, located at Eglin AFB, FL, conducts and supports developmental test and evaluation and operational test and evaluation of non nuclear air armaments, electronic combat systems, and target acquisition and weapon delivery systems; provides a climatic simulation capability; and determines target/test item electronic signatures. The Preflight Integration of Munitions and Electronic Systems (PRIMES) provides the instrumentation to conduct preflight checkout of total integrated weapon systems in a secure anechoic chamber. The Guided Weapon Evaluation Facility (GWEF) provides a full spectrum, multifunctional seeker/sensor laboratory test capability for all guided weapons. The Advanced Airborne Test Instrumentation System (AATIS) builds on the Airborne Test Instrumentation (ATI) project and will be completed under the Common Airborne Instrumentation System Integration and Support (CAIS I&S) project (managed by the AFFTC). AATIS fills the gap between older airborne data acquisition systems and the "common" data acquisition system of the future (CAIS). Seeker T&E provides ground and airborne test instrumentation support for infrared (IR), millimeter wave (MMW), and laser weapon RDT&E programs. The Armament Systems Test Environment (ASTE) Range Systems effort upgrades instrumentation of the major data collection systems supporting munitions test requirements. The Electromagnetic Test Environment (EMTE) Range Systems modernizes instrumentation which supports the electronic combat and munitions test requirements. Mission Control/Data Analysis provides for real-time central mission control and analysis. GPS Range Systems will provide a major improvement for Time-Space-Position-Information (TSPI) at all MRTFB locations and specifically at the Eglin ranges for munitions testing. These projects ensure test center technology is compatible with weapon systems to be tested such as AMRAAM, MMW MAVERICK, AGM-130, Sensor Fused Weapon, JTIDS, JSTARS, Silent Attack Warning System, etc. The Climatic Test Facility modernization of instrumentation and environmental capabilities supports the major upgrade which will extend its useful life to 2015.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) PRIMES procured an ECM Generator System and a fiber optic distribution network/supporting instrumentation. (\$2.1M)
- (U) GWEF completed the MMW Simulator System. The multispectral test area and the fiber-optic link between GWEF and PRIMES began initial operation. (\$1.0M)
- (U) ATI procured aircraft instrumentation. (\$1.5M)
- (U) Seeker T&E began the MMW 140 GHz radar procurement and procured a spectrometer and radiometer for target and background signature measurement and hardware and software for the Thermal Imaging Processing System. (\$2.6M)
- (U) ASTE Range Systems continued upgrading data collection systems with emphasis on gun ranges, microwave towers, range telemetry, and cinetheodolites. (\$0.1M)
- (U) EMTE Range Systems began initial procurement of the Scanning Transient Pulse Measurement System and continued EMTE instrumentation upgrades. (\$0.8M)

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- (U) Mission Control/Data Analysis project provided data analysis equipment to perform real-time operational and post-mission data processing. (\$2.1M)
- (U) GPS Range Systems procured airborne transponders/receivers to interface with on-board GPS hardware. (\$0.8M)
- (U) Upgrades to the Climatic Test Facility continued with the procurement of a fiber-optics data system. (\$0.6M)
- (U) Per Congressional language, funds were transferred to GPS RAJPO to foster competition. (\$2.6M)

2. (U) FY 1993 Planned Program:

- (U) PRIMES will procure instrumentation and simulation equipment capable of greater bandwidth and higher speed and begin procurement of a flight environment simulator. (\$2.1M)
- (U) GWEF will complete the multispectral test area interconnect and begin development of an IR scene generator. (\$1.5M)
- (U) Transition to AATIS to upgrade aircraft instrumentation. (\$3.0M)
Note: AATIS and CAIS use the same data bus (electronic circuitry that interconnects the data acquisition systems). AFDTTC is buying AATIS equipment through the AFFTC to bridge the gap between current systems and CAIS. In future years, the CAIS acquisition will be handled under AFFTC.
- (U) Seeker T&E will begin procurement of weather instrumentation and a spectral radiometer. (\$3.2M)
- (U) ASTE Range Systems will continue upgrading cinetheodolites, microwave towers, and range telemetry. (\$2.0M)
- (U) EMTE Range Systems will continue procurement of the Scanning Transient Pulse Measurement System, continue EMTE instrumentation upgrades, and begin equipment installation. (\$2.5M)
- (U) Mission Control will complete the real-time test support capability and begin procurement of system for processing and displaying information in the classified mission areas. (\$1.7M)
- (U) GPS Range Systems will procure additional RAJPO pods. (\$0.9M)
- (U) Additional data systems will be acquired for the Climatic Test Facility along with climatic simulation equipment. (\$0.5M)

3. (U) FY 1994 Planned Program:

- (U) PRIMES will complete the second phase of the GWEF/PRIMES link to provide interoperability between PRIMES and GWEF to allow the aircraft to "fly" in PRIMES and "launch" the munitions in GWEF to simulate an open air flight test mission. (\$2.9M)
- (U) GWEF will complete the acquisition of the IR scene generator and begin procuring equipment to support the mid-course lab. Software development will begin to utilize the distribution network to support dual mode seeker testing. (\$1.4M)
- (U) Seeker T&E will continue development of MMW radar, consolidation of IR pods, and complete procurement of a second ground/airborne IR pod. This pod provides a signature measurement capability to support tri-Service test requirements. (\$1.0M)
- (U) ASTE Range Systems will continue upgrading microwave towers, provide a remote cinetheodolite system, range telemetry, and an IR imaging and tracking system (range photo-optics). (\$3.9M)
- (U) Mission Control/Data Analysis will continue procurement of data display equipment to support two new classified mission control rooms. These control rooms will be completed in FY95. (\$0.7M)
- (U) GPS Range Systems will begin data link acquisition and equipment integration, and initiate integrated TSPI range efforts to incorporate RAJPO equipment integration. (\$2.2M)
- (U) Climatic Test Facility will continue upgrades to mechanical support

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equipment for the smaller test chambers. (\$0.6M)

4. (U) Program to Completion: This is a continuing project.
- D. (U) WORKED PERFORMED BY: Cross Systems, Atlanta, GA (GWEF); TRW, Warner Robins, GA (PRIMES); GEC Avionics Ltd, London, England; and Southern Research Technology, Birmingham, AL (Seeker T&E).
- E. (U) COMPARISON WITH FY 1993 DESCRIPTIONS SUMMARY:
 1. (U) Technical Changes: Not Applicable.
 2. (U) Schedule Changes: Not Applicable.
 3. (U) Cost Changes: Not Applicable.
- F. (U) PROGRAM DOCUMENTATION: PMD 2164(6)/0604755F Improved Capability for DT&E.
- G. (U) RELATED ACTIVITIES:
 - (U) PE 0604940D, Test Instrumentation Development.
 - (U) PE 0604256F, Threat Simulator Development Program.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
 - (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.
- H. (U) OTHER APPROPRIATIONS: Not applicable.
- I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.
- J. (U) MILESTONE SCHEDULE: This is a continuing project.

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A. (U) RESOURCES (\$ in Thousands):

Project Title	FY 1992	FY 1993	FY 1994	To	Total
Popular Name	Actual	Estimate	Estimate	Complete	Program
3620 Air Force Flight Test Center (AFFTC)	20,525	17,239	28,491	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AFFTC, located at Edwards AFB, conducts and supports developmental test and evaluation and operational test and evaluation of aircraft and aircraft systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachute delivery/recovery systems, and cargo handling systems. Reentry support and engineering evaluation is provided to the Space Shuttle program. AFFTC operates the Air Force Test Pilot School (AFTPS). The Avionics Test and Integration Complex (ATIC) will allow ground testing of advanced aircraft integrated network, including all flight control features as well as avionics. The R-2508 upgrade alleviates a safety of flight problem in the range complex. This is a joint Air Force/Navy project to increase the radar coverage on the range, reducing the probability of mid-air collision. Advanced Data Acquisition and Processing System (ADAPS) will provide improved access to test data both in real time and post test, and is built upon the existing Integrated Flight Data Processing System (IFDAPS) capability. The AFFTC Range Instrumentation Upgrade project, Digital Switch, will provide communication equipment and an automated, digital switching capability. Advanced Range Data System (ARDS) is a highly accurate TSPI data and communications system which takes advantage of the Global Positioning System (GPS). Edwards Local Range Network (ELRAN) will provide AFFTC with a secure data communications network. Test and Evaluation Mission Simulator (TEMS) upgrade will equip simulators with advanced computers and visual systems to satisfy latest aircraft technology simulation requirements. The AF Common Airborne Instrumentation System Integration and Support (CAIS I&S) project is a joint effort by AFDTIC, AFFTC, and the 4950TW and supports DoD objectives for interoperability/commonality. The goal of CAIS I&S is the integration of CAIS equipment and supporting instrumentation equipment and systems to provide a full airborne instrumentation operational capability. The Advanced Airborne Test Instrumentation System (AATIS) builds on the Airborne Test Instrumentation System (ATIS) project and will be completed under the CAIS I&S project. AATIS fills the gap between older airborne data acquisition systems and the "common" data acquisition system of the future (CAIS). Computer aided engineering/manufacturing (CAE/CAM) will provide an integration of mechanical engineering, electronic engineering, analysis, simulation, and drafting to the interactive design requirements of test programs. Avionics Test Bay Systems (ATBS) upgrade provides new generic spread-bench capabilities to ground test integrated, advanced avionics systems. The Scientific and Engineering Computer Acquisition Project (SECAP) provides AFFTC systems integration to the new scientific and engineering mainframe computers acquired for advanced acquisition and data processing. Automated Test Data Management System (ATDMS) will provide the computer hardware, software, peripherals, and integration required to automate the management of mission test data from test inception to post test processing. These projects ensure test center technology is compatible with the weapon systems to be tested such as F-16, F-22, C-17, B-2, and NASP.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Continued R-2508 upgrade equipment purchase. (\$2.1M)
- (U) Continued Range Upgrade (digital switch) delivery and integration of

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- hardware for additional control rooms. (\$3.6M)
- (U) IOC of basic ARDS central preprocessors. Began procurement of advanced TSPI. (\$3.5M)
- (U) Began acquisition planning system design and prepared planning documents for the Edwards Local Range Network. (\$0.7M)
- (U) Began testing of high-performance real-time system capability for ADAPS and began ATDMS concept study. (\$2.8M)
- (U) Continued TEMS training and software upgrades. (\$1.6M)
- (U) Began Airborne Test Instrumentation System (ATIS) software development/developed signal conditioning module. (\$2.1M)
- (U) Procured CAE/CAM workstations. (\$0.1M)
- (U) Began ATBS installation, continued software adaptation, and began procurement actions. (\$1.1M)
- (U) Began SECAP efforts/awarded initial SECAP contracts. (\$0.9M)
- (U) Procured GPS range equipment. (\$2.0M)

2. (U) FY 1993 Planned Program:

- (U) Continue Range Upgrade (digital switch) with procurement of hardware, installation, and checkout in control rooms. (\$2.1M)
- (U) Complete ARDS central processor integration, delivery, and checkout of first RAJPO production GPS equipment and continue advanced TSPI upgrades. Develop specifications for mobile processor. (\$4.4M)
- (U) Continue Edwards Local Range Network development with further expansion of base fiber optic network to interconnect additional test facilities. (\$0.7M)
- (U) Continue development of ADAPS and ATDMS by evaluating prototype systems. (\$4.0M)
- (U) Continue TEMS training and installation. (\$0.4M)
- (U) Transition to AATIS upgrade and upgrade large/small transport aircraft ground support systems. (\$2.0M) Note: AATIS and CAIS use the same data bus (electronic circuitry that interconnects the data acquisition systems). The Army and Navy are buying AATIS through the AFFTC to bridge the gap between current systems and CAIS.
- (U) Procure CAE/CAM integrated mechanical and electronic design, analysis, drafting, and documentation capabilities. (\$.8M)
- (U) Begin CAIS I&S integration planning and support in preparation for first test units. (\$0.3M)
- (U) Continue ATBS equipment and software upgrade. (\$1.0M)
- (U) Fund an equipment compatibility study for the National Air Space Plan to make Air Force test ranges compatible with the new FAA equipment. (\$0.2M)
- (U) SECAP first system IOC. (\$0.2M)
- (U) Begin preparation for integration of Integrated Data Facility (IDF). (\$1.3M)

3. (U) FY 1994 Planned Program:

- (U) Continue Range Upgrade (digital switch) with procurement of hardware, installation, and checkout in control rooms. This effort will permit voice interoperability and allows secure transfer of test data among all major test ranges. (\$0.9M)
- (U) Continue Edwards Local Range Network development with further expansion of base fiber network to interconnect additional test activities. This effort will use commercial off-the-shelf equipment, standard data rates, interfaces, and format which support data transfer to other test locations. (\$1.0M)
- (U) Continue development of ADAPS and ATDMS by implementing high-performance, real-time systems, and post-test capability. This effort will provide a high degree of interoperability between systems by adherence to DoD mandated guidelines and standards. (\$5.8M)

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Budget Activity: #6 - Defense-wide
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- (U) Continue TEMS training and installation. Equipment will be interoperable with other T&E simulators throughout the DoD. This will allow the weapon system in the anechoic chamber to be "flown" from the adjacent simulator. (\$0.4M)
- (U) Continue GPS procurement and begin initial integration of ground TSPI upgrades to implement a base wide GPS timing standard. (\$7.7M)
- (U) Complete AATIS component acquisition and continue engineering for the CAIS I&S project. This project will increase range commonality and support the transition to the CAIS equipment. (\$4.35M)
- (U) Integrate CAE/CAM electronic circuit simulation and printed circuit board preparation capabilities. This effort will make the AFFTC electronically compatible with all tri-Service test and engineering centers as well as industry. (\$1.6M)
- (U) Begin ATBS hardware installation and continue software adaptation. (\$0.7M)
- (U) Upgrade Utah Test and Training Range (UTTR) TSPI, instrumentation, data processing and display, and data network in order to sustain the UTTR capability. (\$0.75M)
- (U) The following are 4950TW efforts added to the AFFTC project.
- (U) Award contracts for the ARIA Space Based Data Relay System program and begin engineering/design efforts. Avionics and radome development will be the focus of the engineering efforts. (\$4.0M)
- (U) Award contract for antenna feeds for the ARIA Extended S-Band program engineering design efforts. Begin procurement of replacement receivers and bandpass filters. (\$1.0M)
- (U) Procure/install telemetry, data recording, and computer equipment for the Advanced Radar Testbed Aircraft (ARTB) and begin initial procurement of replacement recorder electronics and timing equipment on the ARIA. (0.3M)

4. (U) Program to Completion: This is a continuing project.

D. (U) WORKED PERFORMED BY Computer Science Corporation, Lompoc, CA (Integrated Facility for Avionics Systems Test); Ball Systems Engineering Services, San Diego, CA (Advanced Range Data System); Scientific Applications International Corp.; Los Angeles, CA; Data General Corp.; Irvine, CA; and AFFTC in-house resources.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable.
2. (U) Schedule Changes: Not applicable.
3. (U) Cost Changes: Not Applicable.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(6)/0604755F Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:

- (U) PE 0604940D, Test Instrumentation Development.
- (U) PE 0604256F, Threat Simulator Development Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate unwarranted duplication.

H. (U) OTHER APPROPRIATIONS: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: This is a continuing project.

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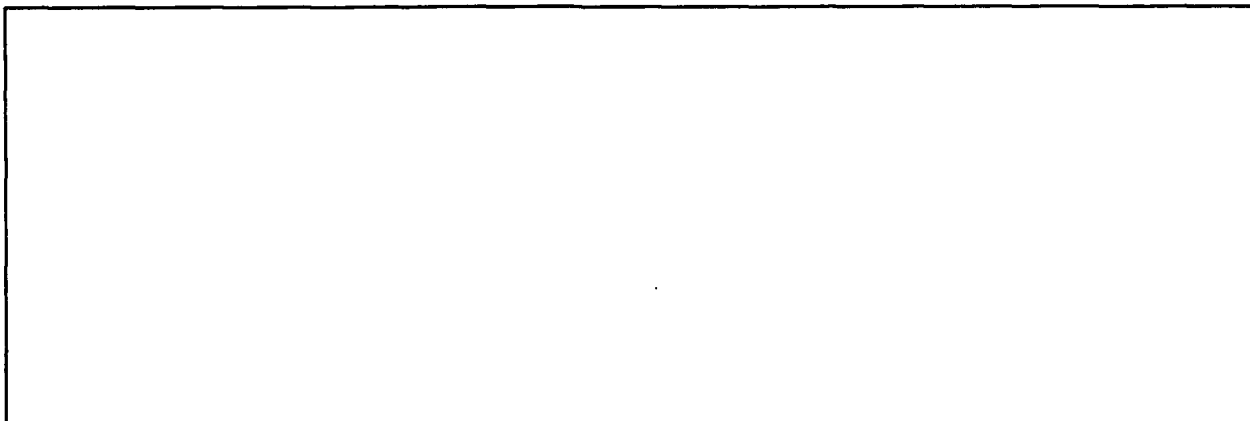
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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0604770F
PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs

Project Title: N/A



POPULAR NAME: Joint STARS

A. (U) SCHEDULE/BUDGET INFORMATION (\$ in Thousands):

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones		DAB Review for LRIP May 93		DAB III 4QFY95 IOC 2QFY97
Engineering Milestones	Air Vehicle CDR May 92	3d A/C Syst CDR Feb 93	SDS Block IIA PDR 3QFY94	SDS Block IIA CDR 3QFY95
T&E Milestones		SLPV Compl; Limited Jun 93	3d A/C Dev. Tests Compl. Sep 94	MOT&E Complete 3QFY95
Contract Milestones	1st Adv Buy Contract Award	1st Prod Contract Award		Full Rate Production Contract 10FY96
BUDGET (000)	FY 1992	FY 1993	FY 1994	Program Total To Complete
Major Contract	256,600	240,700	182,100	858,000
Support Contract	24,400	27,100	23,400	99,100
In-House Support	7,000	4,100	3,900	49,100
GFE/Other	20,300	41,500	85,800	123,800
TOTAL	308,300	313,400	295,200	1,130,000

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Program Element: 0604770F
PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs
Date:

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

There is an Army and Air Force need to provide, from airborne platforms, near-real-time surveillance and targeting information on moving and stationary ground targets (growth to maritime operations), slow moving rotary and fixed-wing aircraft, and rotating antennas. This information would enable operational and tactical commanders to make and execute battle decisions. To meet these needs, the Air Force and Army initiated the Joint Surveillance Target Attack Radar System (Joint STARS) program with the Air Force as lead service. Joint STARS will be capable of wide area surveillance, detection, location, classification, tracking, and monitoring of moving targets. The system will also be capable of providing target information for pairing direct attack aircraft and standoff weapons against selected targets. The system will be capable of being cued by other reconnaissance, surveillance, and target acquisition systems; will be able to respond rapidly to worldwide contingencies; and will provide surveillance and attack information in all light and near-all-weather conditions. The operational utility of the system was effectively demonstrated by the outstanding performance of the two developmental aircraft in support of combat operations during Desert Storm.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Start of System Level Performance Verification (SLPV).
- (U) Four-Star Summit Review conducted, Nov 15, 1991.
- (U) Advance Buy contract award (2 Aircraft)
- (U) Nonrecurring engineering, refurbishment, and modifications to the production-representative aircraft continued.
- (U) Critical Design Review for prototype airframe.
- (U) Self Defense Suite (SDS) Block I contract award.

2. (U) FY 1993 Planned Program:

- (U) DAB Program Review for LRIP 3Q FY93.
- (U) Advance procurement for the 2nd Lot will be awarded.
- (U) Government DT&E and Limited User Tests will continue.
- (U) Critical development efforts required for IOC will begin: Ground Support Systems, Phase I; Maintenance Trainers and Flight Crew Training; E-8A Test/Integration.
- (U) SDS Block IIA will be awarded.

3. (U) FY 1994 Planned Program:

- (U) Ground Support Systems Phase II development effort will begin.
- (U) Developmental tests of 3rd EMD aircraft will begin.
- (U) Advance Procurement for the 3rd lot will be awarded.

4. (U) Program to Completion:

- (U) Milestone III Production Decision, FY95.
- (U) Software Support Facility delivery, FY95.

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Program Element: 0604770F
PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs

- (U) Operational tests with the 3rd aircraft will commence, FY95.
- (U) First production aircraft will be delivered 2Q FY96.
- (U) Government Developmental Test/Multi-Service Operational Test and Evaluation (DT/MOT&E) will be completed.
- (U) Follow-On Operational Test and Evaluation will be conducted.
- (U) Depot activation will begin 2Q FY96.
- (U) The Joint STARS system will be deployed.
- (U) Initial Operational Capability (IOC), 2Q FY97.

D. (U) WORK PERFORMED BY: The major contractor is Grumman Melbourne Systems Division, Melbourne FL. The radar sets are manufactured by Norden Systems, Norwalk CT. The Joint Program Office is located at Electronics Systems Center, Hanscom AFB MA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Start of the System Level Performance Verification (SLPV) was delayed from 3Q FY91 to 1Q FY92 by the Desert Storm deployment. The DAB Review for LRIP was rescheduled from Mar 93 to May 93 to resolve issues encountered during SLPV.
3. (U) COST CHANGES: The FY94 planning/budgeting process identified a \$100M shortfall. The shortfall resulted from: FY93 MILCON cut; repricing of baseline program content, cost growth associated with activating the Main Operating Base (MOB) at Warner-Robins AFB vice Dyess AFB; and the need to correct communications deficiencies identified during Operation Desert Storm. Therefore, the production program was restructured and the shortfall was funded, using available funds.

F. (U) PROGRAM DOCUMENTATION:

- | | |
|--|--------|
| - (U) TAF SON 309-82 (S) | Jun '2 |
| - (U) USAF/USA MOU | Apr 85 |
| - (U) JSORD (S) | Feb 92 |
| - (U) OUE 1 Report (S) | Feb 88 |
| - (U) DCP (DAB IIB) (S) | Apr 88 |
| - (U) ADM (DAB IIB) | Jul 88 |
| - (U) DCP (Oct 89 DAB) | Oct 89 |
| - (U) ADM (Oct 89 DAB) | Nov 89 |
| - (U) JROCM-065-90 | Sep 90 |
| - (U) PMD 6027(22) | Apr 92 |
| - (U) PE 0604770A, The Army RDT&E Joint STARS Program. | |

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Program Element: 0604770F
PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:

- (U) The Army Joint STARS Ground Station Module (GSM) development is funded under Army Other Procurement Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ in Thousands):

1. (U) Procurement: PE 0207581F/(BA4 & BA6)

	FY 1992 <u>Actual</u>	FY 1993 <u>Actual</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	137,800	607,900*	426,500	3,658,200	4,830,400

2. (U) Military Construction: PE 0604770F

	FY 1992 <u>Actual</u>	FY 1993 <u>Actual</u>	FY 1994 <u>Estimate</u>	To <u>Complete</u>	Total <u>Program</u>
Cost	18,800	10,800	25,200	108,200	163,000

* Sharp increase is due to production start up in FY93 (funding of two production aircraft as well as two shipsets of advance buy material).

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The final volume of the Standoff Radar Program Studies (SORPROS), a US/UK program, was completed in Oct 92.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

<u>Event</u>	<u>Date</u>	<u>Results</u>
Operational Field Demo	Sep-Oct 90	Successful Demo of Capability in European Theater
Desert Storm	Jan-Mar 91	Successful Wartime Deployment of Developmental System
Government SI/PE	Sep 91	Advance Buy Exit Criteria Successfully Evaluated
SLPV Start	Oct 91	Will support the DAB Program Review for LRIP

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Program Element: 0604770F
 PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs

T&E ACTIVITY (TO COMPLETION)

<u>Event</u>	<u>Planned Date</u>	<u>Remarks</u>
Contractor/Gov't. SLPV Completion	Mar 93	On Aircraft 1 and 2 for Aircraft DAB LRIP Review
Air Worthiness Tests	Aug 93	For E-8C Technical Orders Data
MOT&E	1Q FY95 - 3Q FY95	Dedicated Multi- Service Operational
SDS Block I Tests	Jun/Jul 93	Self Defense Suite Group A

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604779F Budget Activity: #4 - Tactical Programs
 PE Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
NONE Joint Interoperability of Tactical Command and Control Systems (JINTACCS)	4,818	6,785	4,996	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: JINTACCS is a joint interoperability program to improve the operational effectiveness of all the Services' Tactical Command & Control (C2) Systems used in support of joint operations. JINTACCS supports Air Force participation with the Army, Navy and Air Force, and the Joint Interoperability and Engineering Organization (JIEO) which acts as the Executive Agent. Service and agency activities are governed by jointly agreed upon and Joint Chiefs of Staff (JCS) approved documentation including Technical Interface Concepts and Technical Interface Design Plans. Close liaison across each of the Service JINTACCS programs precludes duplication of efforts. Elements of the Tactical Air Intelligence System, E-3 Airborne Warning and Control System, and Joint Tactical Information Distribution System (JTIDS) participate in this program. The JINTACCS program, formerly Ground and Amphibious Military Operation (GAMO) is directed by JCS Memorandum 205-72 dated 1 April 1971, as modified by a Secretary of Defense memorandum, "Reorganization of the DoD Program to Achieve Interoperability of Tactical C2 Systems for GAMO," dated 2 Aug 1977. The program complies with requirements of DoD Directive 4630.5, "Compatibility, Interoperability, and Integration of Command, Control, Communications, and Intelligence (C3I) Systems", November 12, 1992 and DoD Directive 4630.8, "Procedures for Compatibility, Interoperability, and Integration of C3I Systems", November 18, 1992.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Joint Interoperability of Tactical Command and Control Systems (JINTACCS): The JINTACCS program entails development, testing, implementation and configuration management of message text formats (MTF) and data link standards; and support of maintenance and testing of MTF and data link operational standards. This project supports the efforts to ensure C3 systems interoperability among all the CINCs, DoD agencies, and the services.

(U) FY 1992 Accomplishments:

- (U) Began integration of Modular Control Equipment (MCE) Operational Facility (OPFAC) into test facilities.
- (U) Began equipment acquisition for Airborne Battlefield Command and Control Center (ABCCC) and Modular Air Operations Center (MAOC) OPFACs into test facilities.
- (U) Expanded MTF certification testing to fielded systems.
- (U) Continued development of Tactical Digital Information Link-J (TADIL-J) capability and advanced MTF message software.
- (U) Continued development of network design aids and training for JTIDS network design facility and architecture.
- (U) Continued integration of MTF parser into Wing Command and Control System (WCCS) and Contingency Tactical Automated Planning System (CTAPS).

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Program Element: #0604779F Budget Activity: #4 - Tactical Programs
PE Title: Joint Interoperability of Tactical
Command and Control Systems (JINTACCS)

(U) FY 1993 Planned Program:

- (U) Begin integration of ABCCC and JSTARS OPFAC into testbed and development of automated test analysis system.
- (U) Begin AF testing of the TADIL-J message standard and modification of message standards to support Theater Missile Defense (TMD).
- (U) Begin development of digital message transfer device and variable message format standards.
- (U) Continue development of TADIL-J capability and advanced MTF message software.
- (U) Continue development of network design aids and training for JTIDS network design facility and architecture.
- (U) Expand MTF certification testing to fielded systems.
- (U) Complete integration and acquisition of MCE and ABCCC OPFACs into test facilities.
- (U) Complete integration of MTF parser into WCCS and CTAPS.

(U) FY 1994 Planned Program:

- (U) Begin acquisition of Iceland Air Defense System (IADS) Radar Special Interface Unit (RSIU).
- (U) Begin Combat Air Forces (CAF) preliminary testing of TADIL-J in ABCCC and E-3.
- (U) Continue development of TADIL-J capability and advanced MTF message software.
- (U) Continue development of network design aids and training for JTIDS network design facility and architecture.
- (U) Continue Air Force testing of the TADIL-J message standard.
- (U) Continue acquisition of automated test analysis system.
- (U) Continue modification of message standards supporting TMD.
- (U) Continue development of digital message transfer device and variable message format standards.
- (U) Complete integration of ABCCC OPFAC into test facility.

(U) Work Performed By: The Air Combat Command/Battle Management and Interoperability Division (HQ ACC/DRI), Langley AFB, VA, has the coordinating and implementing authority. Management responsibility for RDT&E funding is assigned to the Air Force Material Command (AFMC) Wright-Patterson AFB, OH.. Operational support, involves a Participating Test Unit (PTU) at the Air Force Tactical Systems Interoperability Support Center at Langley AFB, VA, for compatibility and demonstrations. The JINTACCS contractors are the COMPTeK Research, Inc., Buffalo, NY, and the MITRE Corporation, Bedford, MA.

(U) Related Activities:

- (U) PE 0604780M, Joint Interoperability for Tactical Command Control Systems; PE 0604779N, JINTACCS Program; PE 0604779A, JINTACCS Program; PE 0208045D, C3 Interoperability/Joint Tactical C3 Agency; and PE 0208298D, Management Headquarters.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Applicable Funds:

- (U) Not Applicable.

(U) International Cooperative Agreements:

- (U) Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605101F Budget Activity: #6 - Defense-Wide
Mission Support
PE Title: RAND Project AIR FORCE

A. (U) RESOURCES (\$ In Thousands)

<u>Project Number & Title</u>	<u>FY 92 Actual</u>	<u>FY 93 Estimate</u>	<u>FY 94 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
Total	22,488	22,380	26,748	Cont	TBD
	22,488	22,380	26,748	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program funds RAND Project AIR FORCE (PAF), AF Studies and Analysis Federally Funded Research and Development Center. It provides for continuing analytical research across a broad spectrum of issues and concerns. PAF research agenda is focused primarily on mid- to long-term problems, but PAF selectively provides direct assistance on high priority near-term issues. Results and analytical findings directly impact senior management deliberations on major issues. Air Force Advisory Group (AFAG), chaired by AF Vice Chief of Staff, reviews, monitors, and approves PAF research effort. Each project is initiated, processed, and approved IAW AFR 20-9 which requires General Officer (or SES equivalent) sponsorship and involvement on a continuing basis.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) XXXI, RAND Project AIR FORCE:

(U) FY 1992 Accomplishments:

- (U) Principal research efforts included studies on future AF force structures:
 - (U) Persian Gulf strategy
 - (U) Nuclear proliferation
 - (U) Investment strategies for TACAIR
 - (U) Desert Storm assessment
 - (U) Low observable/counter low observables analysis
 - (U) Costs/benefits of space systems
 - (U) Targeting for advanced precision guided munitions
 - (U) Conventional employment of bombers
 - (U) Theater missile defense
 - (U) Maintaining design capability for military aircraft
 - (U) Multi-echelon spares and repairs management
 - (U) AF planning process
- (U) Direct assistance studies included:
 - (U) Analyzing Airpower's Changing Role in Joint Theater Campaigns
 - (U) Testing of the two-level maintenance concept
 - (U) Support to the Air University War Game

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Program Element: #0605101F

Budget Activity: #6 - Defense-Wide
Mission Support

PE Title: RAND Project AIR FORCE

(U) FY 1993 Planned Program:

- (U) The Air Force Advisory Group has approved a restructuring of the Project AIR FORCE research program into the following seven areas:
 - (U) Acquisition
 - (U) Logistics
 - (U) C3I/Space
 - (U) Force Structure
 - (U) Strategy/Doctrine
 - (U) Force Employment
 - (U) Force Modernization
- (U) Direct assistance efforts will include:
 - (U) Analysis of cost savings from DMRDs
 - (U) Air Force Roles and Missions
 - (U) Future force structure options

(U) FY 1994 Planned Program:

- (U) Continue critical research support:
 - (U) In the seven areas listed above
 - (U) Develop a database on the world's air forces
- (U) FY 94 increase due to the direction of the Secretary of the Air Force and the Air Force Advisory Group to stabilize Project AIR FORCE:
 - (U) 125 Member of Technical Staff
 - (U) Minimum level required to support the analytical needs of Air Force leadership

(U) Work Performed By: The RAND Corporation, Santa Monica, CA.

(U) Related Activities:

- (U) Project AIR FORCE efforts span functional and organizational boundaries. As a result, the research conducted relates to a wide spectrum of AF Activities.
- (U) Results are deposited with the Defense Technical Information Center for appropriate dissemination to other qualified recipients.
- (U) To assure relevance and to prevent unnecessary duplication, each newly proposed research effort is reviewed by the Air Force Studies and Analysis Agency.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605306F
PE Title: Ranch Hand II
Epidemiology Study

Budget Activity: #6 - Defensewide
Mission Support

A. (U) RESOURCES (\$ in Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
2767 Ranch Hand II Epidemiology Study	9580	8925	3707	Cont	TBD
Total	9580	8925	3707	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program was directed in 1980 by the Assistant to the President of the United States for Domestic Affairs and Policy upon the recommendation of the Interagency Working Group on the Possible Long-Term Effects of Phenoxy Herbicides and Contaminants. As a result of this Presidential direction, PE 0605306F was established to conduct a 20-year epidemiology investigation of Air Force personnel who were involved with aerial spraying of herbicides in Vietnam from 1962 to 1971 (Operation Ranch Hand). The objective of this investigation is to determine whether long-term health effects exist and can be attributed to occupational exposure to phenoxy herbicides and their associated dioxins. Dioxin is an unwanted by-product from manufacturing Herbicide Orange.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

(U) Project 2767 - Ranch Hand II Epidemiology Study: This project involves a 20-year study that compares United States Air Force (USAF) Ranch Hand personnel to other USAF crew members and support personnel who were not exposed to herbicides while serving in Vietnam. Approximately 2,800 individuals remain eligible for the study. Currently 1,000 exposed personnel and 1,200 of the control group actively participate in the examinations. Analyses of yearly mortality rates and the past and present health status of the study population were begun in 1982 with follow-up health examination schedules at the 3-, 5-, 10-, 15-, and 20-year time periods (with attendant funding requirements in examination years). The study includes examination of the possible occurrence of birth defects in children as determined from children's medical records and family medical histories, though no medical examinations or psychological questionnaires have been administered to spouses or children.

(U) FY 1992 Accomplishments:

- (U) Completed Air Force Health Study (AFHS) program plan and biomedical study plan.
- (U) Published report of mortality associated with exposure.
- (U) Completed examination of 1,450 participants.
- (U) Published reproductive outcomes study.

(U) FY 1993 Planned Program:

- (U) Complete Year-10 physical exams and questionnaires.
- (U) Verify examination questionnaire database.
- (U) Complete serum dioxin assays.
- (U) Complete medical records coding.

(U) FY 1994 Planned Program:

- (U) Complete statistical analyses of the Year-10 physical exams.
- (U) Complete mortality update study.

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Program Element: #0605306F
PE Title: Ranch Hand II
Epidemiology Study

Budget Activity: #6 - Defensewide
Mission Support

- (U) Work Performed By: This program is managed Human Systems Center, Brooks AFB, TX. The major contractors are Science Application International Corp., McLean, VA; Scripps Research Foundation, La Jolla, CA; and the National Opinion Research Center, Chicago, IL.
- (U) Related Activities:
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense. In fact, this is the only study concerning Agent Orange health effects that is currently ongoing within the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide
Mission Support

A. (U) RESOURCES (\$ in thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
06TG 46th Test Group Support	21,682	22,074	24,313	Cont	TBD
2900 RATSCAT Upgrade	2,000	2,000	2,000	Cont	TBD
688G Aircraft Navigation System Verification	2,000	2,000	2,000	Cont	TBD
Total	25,682	26,074	28,313	Cont	TBD

NOTE: This program element is an Air Force RDT&E Test Infrastructure account which provides direct support to the DOD test mission for the 46th Test Group at Holloman AFB NM. This infrastructure support provides minimum necessary support to keep the doors open for three major test facilities, High Speed Test Track (HSTT), Central Inertial Guidance Test Facility (CIGTF), and Radr Target Scatter (RATSCAT) facility. This PE also provides minor improvement upgrades to the RATSCAT facility.

- B. (U) BRIEF DESCRIPTION OF ELEMENT: The 46th Test Group, a tenant organization at Holloman AFB, NM, is part of the Department of Defense (DOD) Major Range and Test Facility Base (MRTFB). This PE funds test infrastructure overhead support including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of non-repairable or obsolete test equipment; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries, utilities, temporary duty travel, support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects. The unique capabilities of the 46th Test Group include the High Speed Test Track (HSTT), Central Inertial Guidance Test Facility (CIGTF), and the Radar Target Scatter (RATSCAT) facility. Project 688G directly funds DOD-chartered testing of Inertial Navigation Systems. Funding from this PE supports test operations, maintenance, improvement, modernization, and personnel in three major areas. (1) The High Speed Test Track (HSTT) is the designated DOD reliance lead for test track and performs rocket sled testing of DOD aircraft ejection systems, explosive warheads, impact and lethality effects, guidance systems, and other tests requiring realistic simulations of acceleration or high velocity environments, including rain and particle erosion. Upgrade efforts are underway to enable the sled track to support full-scale live fire testing of aircraft. (2) The Central Inertial Guidance Test Facility (CIGTF) is chartered to test integrated navigational aids, such as Global Positioning System (GPS) receivers, stellar trackers for aircraft, and is the Responsible Test Organization (RTO) for field tests of GPS user equipment. The CIGTF is the lead organization for testing Inertial Navigation Systems (INS) used in DOD aircraft and weapon systems. Performance and reliability of these systems is evaluated in unique one-of-a-kind precision test beds that are only available at Holloman AFB. CIGTF combined with the HSTT is the only DOD test agency capable of verifying the reliability of the nations ICBM guidance systems. CIGTF is located at the most seismically quiet location within the nation and therefore is capable of performing ultra low noise type tests for its customers. (3) The RATSCAT facility includes two separate, complementary Radar Cross Section (RCS)

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Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide
Mission Support

measurement sites. The RATSCAT Advanced Measurement System (RAMS) provides highly secure, efficient, and quality measurements from VHF to Millimeter Wave (MMW) on sub-scale to full-scale advanced technology models up to 30,000 pounds. Main site provides the flexibility to measure monostatically and bistatically on multiple configurations ranging from sub-scale models to full-scale actual targets weighing up to 100,000 pounds.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project: 06TG, 46th Test Group Support: This project funds test infrastructure overhead support including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of non-repairable or obsolete test equipment; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries, utilities, temporary duty travel, support contract costs for hardware and software engineering and maintenance. Project infrastructure support is provided for the unique capabilities of the 46th Test Group facilities; the High Speed Test Track (HSTT), Central Inertial Guidance Test Facility (CIGTF), and the Radar Target Scatter (RATSCAT) facility.

(U) FY 1992 Accomplishments:

- (U) Continued sled track infrastructure test support for peacekeeper guidance systems testing, several Infrared Countermeasures (IRCM) systems, Crew Escape System Technology (CREST), the Army Advanced Kinetic Energy Munitions, and Advanced Guidance Technology (AGT).
- (U) Began sled test track support for Theater Missile Defense (TMD) hypersonic lethality testing, Patriot (PAC-3) lethality testing, advanced flare effectiveness testing, F-111 Improved Recovery Parachute (F-111 IRP), and the Army Tactical Missile System (TACMS) dispenser testing.
- (U) Continued level of infrastructure overhead test support for Peacekeeper, Advanced Guidance Technology (AGT), GPS integrated and embedded INS programs, and SDI pointing and stabilization program.
- (U) Assumed lead Service role for Supersonic Sled Track Reliance Agreement.
- (U) Initiated development of the Advanced Reference System (ARS) as an aircraft reference system to support future navigation systems testing.
- (U) Initiated development of "jamming" and "spoofing" capabilities for GPS user equipment.
- (U) Began realignment of sled track deferred from FY91.
- (U) Continued CIGTF infrastructure test support for FAA Precision Approach Program, FAA Non-Precision Approach Program, NASA's Space Telescope Program, B1-B, Enhanced II, and Fiber-Optic Gyro.
- (U) Procured sled track S-Band telemetry data acquisition systems deferred from FY91.

(U) FY 1993 Planned Program:

- (U) Continue infrastructure test support for aircraft navigation systems.

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Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide
Mission Support

- (U) Continue sled track support for Peacekeeper, CREST, IRCM, TMD, PAC-3, TACMS, and F-111 IRP.
- (U) Replace obsolete machine tools to manufacture test sleds.
- (U) Begin sled track support for Israel/Army Arrow lethality testing, Arrow radome testing, Ground-Based Interceptor (GBI) testing, and several tests of rain erosions and aerothermal erosion on radome materials.
- (U) Continue the development of the GPS jamming and spoofing capabilities.
- (U) Provide major field test support to the FAA for GPS navigational and landing aids.
- (U) Initiate development of improved stellar aided test capability.
- (U) Continue to expand use of the ARS.

(U) FY 1994 Planned Program:

- (U) Continue sled track support for Peacekeeper, IRCM, TMD, PAC-3, F-111, Arrow & GBI.
- (U) Begin sled track support for F-22 egress testing, Fourth Generation Seat egress testing, Theater High Altitude Area Defense (THAAD) lethality testing, and Special Infrared (SIR) flare testing.
- (U) Procure IR measurement capability to support IRCM testing at sled track deferred from FY 92.
- (U) Replace obsolete data acquisition systems deferred from FY 92.
- (U) Replace obsolete computational systems deferred from FY 92.
- (U) Continue development of the improved stellar aided capability and fiber-optic gyro.
- (U) Continue detailed support of all FAA GPS field tests.
- (U) Improve GPS simulation capability for the CIGTF.
- (U) Procure an improved data acquisition and processing system for RATSCAT.
- (U) Develop automated trajectory system to reduce the cost of egress, flare and IRCM testing at the sled track deferred from FY 92.

(U) Work Performed By: In house workforce, EG&G Management Systems, Inc., Albuquerque, NM, and Intermetrics, Inc., Huntington Beach, CA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense. The 46th Test Group capabilities have been reviewed by the DOD reliance group to prevent duplication and proliferation of unnecessary test facilities.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 2900, RATSCAT Upgrade. This project provides improvements to RATSCAT in order to assure support to address RCS measurement requirements of DOD customers. The goal is to aggressively pursue upgrades to present capabilities, to augment the Advanced Static Measurement System without compromising or reducing current customer workload or security. Key areas of improvement include radar upgrades, standardization of data

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Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide
Mission Support

processing equipment and techniques, bistatic testing, mobile target shelter for security and shelter, advanced target support pylons with low radar returns, low frequency measurement capability upgrades, advanced real-time radar calibration equipment, engineering laboratory improvements, security system upgrades, efficiency related equipment and facilities. All these areas are imperative to maintain the current capabilities and meet the high technology requirements of customers that will use RATSCAT in the future. An extensive R&D effort continues on radar cross section reduction techniques. It is imperative to maintain the ability to measure these techniques. This project ensures a continuing effort to improve the facility to address the needs of these newer and more demanding weapon system technologies.

(U) FY 1992 Accomplishments:

- (U) Completed fabrication of heavy target mounting device shroud/skirt. (\$0.9M)
- (U) Completed design for low frequency radar improvements at RAMS; procured risk reduction hardware. (\$0.9M)
- (U) Initiated study and analysis of replacement for mobile bistatic radar vans. (\$0.2M)

(U) FY 1993 Planned Programs:

- (U) Initiated third phase acquisition for RVUMS. (\$1.1M)
- (U) Design for improved data acquisition and processing system. (\$0.9M)

(U) FY1994 Planned Program

- (U) Complete last phase acquisition of RVUMS. (\$1.1M)
- (U) Complete deficiency corrections for Integrated Radar Measurement Systems (IRMS). (\$0.7M)
- (U) Initiate procurement for low frequency calibration. (\$0.2M)

(U) Work Performed By: 46th Test Group in-house (Govt) workforce.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 688G, Aircraft Navigation System Verification: Project 688G is a DOD chartered program to conduct tests and evaluations on Inertial Navigation Systems (INS) and Inertially-Aided Navigation Systems (INS-Aided) for use in aircraft and weapon delivery systems and to provide an independent assessment of the performance to benefit DOD and foreign military testers like Canada and England. The purpose of this program is to provide technical performance information on manufacturer supplied navigation systems to Air Force and Navy System Program Offices and other offices that may use these navigation systems for their Off-the-Shelf selection use in their aircraft or weapons delivery system; which includes most of the high accuracy weapon systems now being employed. Project 688G also provides common support for these efforts with a flight reference system called the

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PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide
Mission Support

Completely Integrated Reference Instrumentation System (CIRIS). Tasks undertaken by this project include: INS, INS-Aided testing using a GPS receiver integrated with the INS, Air Force Standard INS qualification and verification testing, Form/Fit/Function Testing, and management and maintenance of CIRIS. This project will ensure a continuing effort to provide better technology in navigation systems for use in aircraft and weapons delivery systems for the DOD as well as foreign military testers.

(U) FY 1992 Accomplishments:

- (U) Continued test support for aircraft navigation systems and equipment, including GPS-aided and GPS User Equipment (UE).
- (U) Maintained time-space position information using CIRIS to directly help the B-52 program.
- (U) Continued development and studied ARS applications to broaden the utility of CIRIS for different reference usage.

(U) FY 1993 Planned Programs:

- (U) Continue test support for aircraft navigation systems and equipment, including GPS-aided and GPS User Equipment.
- (U) Continue direct test support of B-1 and B-52.
- (U) Continue to expand the use of the ARS.

(U) FY 1994 Planned Program:

- (U) Continue test support for aircraft navigation systems and equipment, including GPS-aided and GPS User Equipment.
- (U) Continue direct test support of B-1 and B-52.
- (U) Continue to expand the use of the ARS.

(U) Work Performed By: 46th Test Group in-house (Govt) workforce.

(U) Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Not Applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605712F
PE Title: Initial Operational Test and Evaluation (IOT&E)

Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RDT&E RESOURCES (\$ in Thousands)

Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Initial Operational Test and Evaluation					
PE TOTAL	21,807	26,016	32,811	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds for AF directed tests conducted to evaluate a system's operational effectiveness and suitability and to identify any operational deficiencies or need for modifications in support of the acquisition decision (Milestone III). For major systems designated for use in combat, the law requires IOT&E be completed under realistic field conditions before proceeding beyond low rate initial production. In addition, this PE will fund major Operational Utility Evaluations (OUEs) and Early Operational Assessments (EOAs) which support major milestones and decision points prior to Milestone III. IOT&E is an operational evaluation of a system's performance when the complete system is tested and evaluated against operational criteria by personnel with the same qualifications as those who will operate, maintain and support the system when deployed. In general, IOT&Es are performed on new systems in development, major modifications and other systems as directed. The FY94 list of programs may not be all inclusive due to changing program schedules and "pop-up" requirements. (In FY92 this PE supported eleven pop-up IOT&Es). In FY93 eleven programs were reclassified, and require T&E funding from the Operation & Maintenance (O&M) account. One program was completed; two programs were canceled, and seven new programs were added. Dual Frequency MEECN Receiver/Minuteman (DFMR/MM) has been combined with DFMR/Portable.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

1. (U) Initial Operational Test and Evaluation (66 programs)

(U) FY 1992 Accomplishments:

- (U) Civil Reserve Air Fleet (CRAF) MD-80, Commercial Microwave Landing System Avionics (CMLSA), Mobile MLS (MMLS), AMC C2 Information Processing System (C2 IPS), Defense Meteorological Satellite Program (DMSP) Mark IV-B Fixed Terminal, C-130 Liquid Crystal Display (LCD) Cockpit, BMEWS Radar Upgrade Site Communications System Segment Replacement (CSSR) Phase III, Survivable Communications Integration System (SCIS), Command Center Processing Display System Replacement (CCPDSR), AN/FPS-123 Pave Paws Upgrade Program (PPUP), System 1/Ground Computer Changeout (SYS1/GCO) (to be combined with Survivable DSP in FY93), Satellite 14 Ground Station Upgrades, Cobra Dane System Modernization, Satellite Readout Station Upgrade (SRSU) (to be combined with Survivable DSP in FY93), Granite Sentry, F-16/ALE-47 (F-16 ALE-47 Chaff/Flare Dispenser), E-3 Block 30/35 Upgrade (to be combined with E-3 RSIP), LS-Water Activated Mask Release System (WAMRS), Chemical Warfare Protective Equipment (CWPE) (CWD-Aircrew Eye/Resp Protection (SAC)), Dual Modem Upgrade (DMU) Phase II (combined with Milstar (AN/ARC-171 Dual Modem Upgrade Phase II)), Nuclear Mission Planning and Production

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Program Element: #0605712F

Budget Activity: #6 - Defense-Wide

PE Title: Initial Operational Test
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Mission Support

System (NMPPS), Rapid Execution and Combat Targeting (REACT) (ICBM-Rapid Execution and Combat Target), Offutt Processing and Correlation Center (OPCC), Cheyenne Mountain Upgrade (CMU), Space Defense Operations Center (SPADOC) 4C, Aircrew Eye Respiratory Program (AERP), Compass Call Project 34, Anti-Radiation Missile Decoy System (Arm Decoys), Combat Edge, F-15C/E Tactical Electronic Warfare System (TEWS) (combined F-15E TEWS effort with F-15C TEWS), E-4 High Power Transmit Set (HPTS), Active Noise Reduction/Thermal Flash Protection Devices (ANR/TFPD), LS-Advanced Night Vision System (NVS), Strategic Training Route Complex (STRC/RIIS), Dual Frequency MEECN Receiver Portable (DFMR RCVR/PORTABLE), DFMR in Minuteman Launch Control Center (LCC DFMR RCVR/MINUTEMAN), Water Activated Release Systems/Life Support Equipment (LS Universal Water Activated Release System), Pacer Link II Compatibility, E-4B Command Enhancement Mod Block III-B (E-4B BLK 3B MOD), C-17 IOT&E, Navstar GPS Phase III, Joint Tactical Information Distribution System (JTIDS) MT-OT-I/II-(JTIDS Class 2 Terminal Multiservice), Consolidated Space Operations Center (CSOC) MCC-1B, Over The Horizon Backscatter (OTH-B), Joint Surveillance Target Attack Radar System (JSTARS), Survivable Defense Support Program (DSP-1) (Survivable DSP), AF Mission Support System (AFMSS), Milstar Multi-service (MILSTAR Satellite Communication System), Sensor Fused Weapon (SFW), B-1B Weapon System Trainer (WST), F-22/F-15 (F-22 Advanced Tactical Fighter), Follow-on Tactical Reconnaissance System (FOTRS), B-2, DSP GCN, ALR-56M, F-111 Digital Flight Control, Survivable Base Communication System, Trans Collective Protective System, Minimum Operating Surface Mark System, Contingency Airfield Light System, Combined Advanced Technology Enhanced Design Ensemble, Rapid Utility Repair Kit/Petro Oil Lubricant, CV-22, B-1B.

- (U) F-22: The F-22 program is focused on an 18 month study for the F-22/F-15 comparison test, to be completed in June 1993. Completed the first year of the F-22 operational assessment resulting in a final report to support LRIP decision in 1996. Developed a methodology for determining requirements for an installed test facility, that is needed to complete avionics integration test. Developed verification, validation and accreditation (VV&A) methodology to use with full mission simulation and digital models. Completed and published the avionics test concept.
- (U) Follow-on Tactical Reconnaissance System (FOTRS): FOTRS is a joint tactical reconnaissance improvement effort which contains 3 projects: Unmanned Aerial Reconnaissance System (UARS), Joint Service Imagery Processing System (JSIPS), and the F14R/Advanced Tactical Air Reconnaissance System common sensor suite. Team participated in program planning, documentation review and formulation of test assessment to support Air Force Low Rate Initial Production decision of Sep 92. Conducted the early operational assessment on UARS covering program documentation and program progress; completed in Dec 92.

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PE Title: Initial Operational Test
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Budget Activity: #6 - Defense-Wide
Mission Support

- (U) Milstar: Team participated in program planning, documentation review and formulation of test concept. Completed the Multi-Service Terminal (MST) interoperability demonstration in Mar 92. Completed Ultra High Frequency demonstration requested by SAC. Conducted Terminal Operational Assessment (OA) to support Core Terminal Buyout, Sep 92. Participated in the MST 6000 end-to-end system test, completed in Oct 92.
- (U) Navstar Global Positioning System (GPS): Completed IOT&E on the GPS user equipment. The user equipment full rate production decision occurred in Jan 92. AFOTEC is currently conducting a three-phased IOT&E on the GPS space and control segments. Phase I and II are completed. Phase III IOT&E is currently planned for FY94 to support the GPS Full Operational Capability (FOC) declaration by Air Force Space Command. Testing to date has shown the GPS two-dimensional and three-dimensional navigation capabilities meet or exceed requirements.
- (U) B-2: B-2 OT&E program continues to develop the survivability modeling and simulation facility at Kirtland AFB, NM. Hardware, software, and models were integrated into a sophisticated-oriented architecture. A comprehensive Validation, Verification and Accreditation (VV&A) program was established. Several software evaluations were completed on both aircraft and supporting ground equipment software.
- (U) Sensor Fused Weapon (SFW): Test Completed. Testing evaluated the effectiveness and suitability of the SFW to achieve multiple vehicle kills per fighter/attack aircraft pass, on armored vehicle formations.
- (U) C-17: Combined DT&E/IOT&E began. Testing at Edwards AFB, CA. Purpose of testing includes evaluation of the effectiveness and suitability of air refueling, airdrops, short take off and landings.
- (U) Joint STARS: Completed Operational Utility Evaluation (OUE). Initiated operational assessment (OA). Established initial test team presence and continued test planning.
- (U) FY 1993 Planned Program: (60 programs)
 - (U) 60K Loader, Cheyenne Mountain Upgrade (CMU), CMU-Communications System Segment Replacement (CSSR Phase III), Survivable Communications Integration System (SCIS) (CMU-Survivable Comm Integration System), Command Center Processing Display System Replacement (CCPDS-R/Strategic) (CMU-Command Center Process And Display System), Ground Station Update For Satellite 14 (DSP Mobile Ground Station), Cobra Dane System Modernization, Granite Sentry (CMU-Granite Sentry), Alternate Processing and Correlation Center (APCC), Command and Control Center Upgrades/Mobile Command and Control Systems (MCCS) (Mobile C2 System), C2CU/Space Command Center (SPACC) (Space Command Center Upgrades), CMU-

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Program Element: #0605712F

Budget Activity: #6 - Defense-Wide

PE Title: Initial Operational Test
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Mission Support

Space Defense Operations Center 4-C (SPADOC 4C), Improved Data Link (IDL phase II), F-111 Digital Flight Control System (DFCSF), QF-4 Program, Advanced Support Equipment (ASE), F-15C/E Tactical Electronic Warfare System (TEWS), F-16 ALE-47 (Chaff/Flare Dispenser), Survivable Restoral Vehicle/Tower Restoral Vehicle (SRV/TRV), Chemical Warfare Protective Equipment (CWD-Aircrew Eye/Resp Protection SAC), ICBM-Rapid Execution and Combat Target (REACT), LS-Thermal Flash Blindness Protection, Tactics Training Route Complex (TTRC/RIIS), Dual Frequency MEECN RCVR/Portable, Pacer Link II, LS-Universal Water Activated Release System, E-4B Communications Enhancement Mod Block III-B (E-4B BLK 3B MOD), Bomber Airborne Instrumentation System (BAIS), C-17, NAVSTAR GPS Phase III, JTIDS (JTIDS Class 2 Terminal Multiservice), Consolidated Space Operations Center (CSOC), Joint STARS, MILSTAR, B-1B Weapon System Trainer, F-22 Advanced Tactical Fighter, Follow-on Tactical Reconnaissance System (FOTRS), B-2, E-3 Radar System Improvement program (E-3 RSIP), Advanced Training System (ATS), Airborne Electronic Countermeasure Threat Simulator (AETS), ABO-Bratt Communications System, Advanced X-Ray System, B-1B IOT&E, Conventional Mission Plan & Preparation System (CMPPS), MAC C-2 Info Processing System II-IV, Microwave Landing System (MLS)-Mobile, Pave Paws Upgrade Program (PPUP), Integrated Correlation & Display System (ICADS), CMU-Command Monitor Processor & Display System/SAC, NAVSTAR GPS/2, F-16 Blk50D, Compass Call Improvement, EF-111A System Improvement Program (SIP), RRR-Spall/Small Crater Rep (SSCRS), CCD-Aircraft Decoy (Multispec Decoys), Advanced Strategic and Tactical IR Expend (ASTE)/Activated Metal Decoy (AMD), AOD-Proximity Sensor Fuse (PSF), Defense Support Satellite System (DSP1), Active Noise Reduction (LS-ANR).

- (U) Command Center Processing Display System Replacement (Cheyenne Mountain Upgrade-CCPDS-R): Test execution starts Jun 93 for providing accurate, timely, and reliable displays.
- (U) Develop Milstar test plan, Participate in the combined DT/OT&E for Milstar System Test (MST) 8000, Satellite on-orbit testing.
- (U) Space Defense Operation Center 4C (CMU-SPADOC-4C): Block C test execution starts Aug 93.
- (U) Dual Frequency MEECN Receiver (DFMR)-Portable: Test execution starts in FY93 to determine if DFMR can provide reliable and survivable higher authority communication reception for US Strategic Command Alert Aircraft Dispersal Command Post.

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Program Element: #0605712F

Budget Activity: #6 - Defense-Wide

PE Title: Initial Operational Test
and Evaluation (IOT&E)

Mission Support

- (U) B-2: Validation and Accreditation upgrades will be incorporated into the modeling and simulation package. Software evaluation will continue. Early operational assessment and actual IOT&E will occur on the training system (aircrew and maintenance). Block 10 integrated and dedicated IOT&E effectiveness flights will occur.
- (U) F-15 C/E Tactical Electronic Warfare System (TEWS): Test execution. Testing to be conducted at Eglin AFB, FL on electronic warfare package (radar warning receiver, jammer, countermeasure dispenser). Purpose is to evaluate the suitability and effectiveness of the system to receive, identify and encounter threat.
- (U) F-16 ALE-47: Test execution. Testing on F-16 integrated countermeasures dispensing system. Purpose is to evaluate the effectiveness and suitability of system to provide integrated, automatic, computer controlled and reprogrammable dispensing capability.
- (U) Joint STARS: Test support group plans to complete the operational assessment, and continue test planning. Type 1 training contract is due for award in FY93.
- (U) FY 1994 Planned Program: (48 programs identified to date) This program historically supports between 55 and 65 IOT&E efforts per fiscal year. Because of continually changing schedules of the weapons system acquisition programs that these IOT&Es support, about 30% of this activity is typically identified in the last 1-2 months before the fiscal year begins. Therefore, we expect direction will be forthcoming for an additional 7-20 IOT&E efforts in FY94. Dual frequency MEECN Receiver/Minuteman (DFMR/MM) has been combined with Dual Frequency MEECN Receiver/Portable. Survivable Defense Support Program has been combined with DSP-1 System; Advanced Strategic and Tactical IR Expend (ASTE) has been combined with Activated Metal Decoy (AMD). For FY94, three programs have been recategorized and require O&M funding for their T&E activity, 22 programs have been added, three programs have been canceled, and seven programs have been completed in FY93.
- (U) C-17, Navstar GPS III, JTIDS MT-OT-I/II (JTIDS Class 2 Terminal Multiservice), Consolidated Space Operations CTR (CSOC) Joint STARS, Milstar Multi-service (Milstar Satellite Communication System), CV-22, F-22, Follow-on Tactical Reconnaissance System (FOTRS), E-3 Radar System Improvement program (E-3 RSIP), 60K Loader, ICBM-Rapid Execution and Combat Target (ICBM REACT), Cheyenne Mountain Upgrade (CMU), CMU-Survivable Communication Integration System (CMU-SCIS), CMU- Command Center Process and Display System (CMU-CCPDS-R/Strategic), Granite Sentry, Alternate Processing and Correlation Center (APCC), CMU-Space Defense Operations Center 4-C (CMU-SPADOC 4C), Mobile C2 System (MCCS), Space Command Center Upgrades (SPACC Upgrades), Compass Call Project 35, EF-111A System Improvement Program (SIP), B-2, B-1B IOT&E, Integration Correlation and Display System (ICADS), B-1B Weapon System Trainer (WST), LS-Thermal Flash

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Program Element: #0605712F

Budget Activity: #6 - Defense-Wide

PE Title: Initial Operational Test
and Evaluation (IOT&E)

Mission Support

Blindness Protection Device (TFPD), F-15 C/E Tactical Electronic Warfare System (TEWS), F-16 Blk50D, AMC C2 Information Processing System (IPS II-IV), Dual Frequency MEECN Receiver (DFMR)/Portable, RRR-MAT Anchoring, E-4B Communication Enhancement Blk 3B, Armored Multi-Role Vehicle (ABO-ARMRV), Tactics and Training Route Complex (TTRC), E-4B High Power Transmit Set (HPTS), QF-4, ABO-Bratt Communication System (Brattcom), RRR-Spall/Small Crater Repair (SSCRS), CCD-Aircraft Decoy (Multi-Spec Decoys), LS-Active Noise Reduction (LS-ANR), On-Board Electronic Warfare Simulator (OBEWS), Standard Flight Data Recorder (SFDR), Advanced Strategic and Tactical IR Expendable (ASTE) /AMD (Activated Metal Decoy), Sensor Fused Weapon (SFW), Advanced X-Ray, Defense Support Program Satellite System (DSP-1), Compass Call Improvement Program.

- (U) CV-22: Test preparation for test start in FY95. Testing will evaluate the operational effectiveness and suitability of the CV-22 aircraft in performing long range USAF special operation missions.
- (U) EF-111A SIP: Test planning, preparation and execution for transmitter upgrade. Test planning for computer/processor and advanced exciter programs.
- (U) B-2: Continual validation and accreditation upgrades will be incorporated into the modeling and simulation package. Early operational assessment and actual IOT&E will occur on the training systems (aircrew and maintenance). Block 10 integrated and dedicated IOT&E effectiveness flights will occur.
- (U) Work Performed By: AFOTEC expends the highest percentage of its funding in-house in test execution. Support contracts are used to provide specialized expertise in functional disciplines related to test planning and analysis, through several general and special support contracts of long duration. The five contractors supporting RDT&E activities are: Science Applications International Corp (SAIC), Albuquerque, NM; PRC, Inc, Albuquerque, NM; Booz, Allen & Hamilton, Albuquerque, NM; ENTEK, Inc, Albuquerque, NM; and Correa Enterprises, Inc, Albuquerque, NM.
- (U) Related Activities: There is no unnecessary duplication of effort within the Air Force or Department of Defense.
- (U) Other Appropriation Funds (\$ In Thousands): Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605807F Budget Activity: #6 -Defense-wide
 PE Title: Test and Evaluation Support Mission Support

A. (U) RESOURCES (\$ in thousands):

<u>Project</u> <u>Number & Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
06RB Arnold Engineering Development Center (AEDC)	156,034	154,775	171,083	Cont	TBD
06ZA Air Force Development Test Center (AFDTC)	75,110	84,621***	76,643	Cont	TBD
06YA Air Force Flight Test Center (AFFTC)	88,765	99,714	136,384	Cont	TBD
06UC 4950th Test Wing (4950TW)	49,994	47,873	6,000****	Cont	TBD
1013 Utah Test and Training Range (UTTR)	0*	0*	9,820*	Cont	TBD
TOTAL	369,903**	386,983**	399,930	Cont	TBD

*Funding for UTTR will be Zero Base Transferred from PE 0708019F to PE 0605807F effective in FY94. O&M DBA funding from PE 0708019F amounted to \$13.206M in FY92 and \$16.374M in FY93.

**To properly baseline the FY94 program, the UTTR O&M funds identified above should be added to these totals to bring PE 0605807F funding in FY92/FY93 to \$383,109K and \$403,357K. respectively. This reflects actual negative growth.

***Project 06ZA FY93 figure includes \$2.442M for Poker Flats funding IAW Congressional direction.

****Represents funding for 4950TW Developmental Modification and Manufacturing Facility (DMMF) only. Due to midyear completion of 4950TW transfer to AFFTC, all 4950TW FY94 funding except for DMMF operations is forwarded to AFFTC which will sub-allot project dollars to 4950TW until its closure in June 1994.

From FY94 onward, Project 06UC will reflect DMMF funding profiles.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Test and Evaluation (T&E) Support program provides resources to operate the above Air Force test activities which are included in the Department of Defense (DOD) Major Range and Test Facility Base (MRTFB). The MRTFB is a national asset which is operated and maintained primarily for DOD test and evaluation missions, but is also available to other users (other government agencies, commercial industry, and foreign customers) having requirements for its unique capabilities. Test facilities/capabilities operated through this program include wind tunnels, rocket and jet engine test cells, space environmental simulation chambers, armament test ranges, climatic test facilities, avionics test facilities, aircraft test beds, dry lakebed landing sites, and instrumented test ranges. T&E Support funds test infrastructure overhead activities including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of worn or obsolete test equipment; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries; utilities; temporary duty travel; support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06RB, Arnold Engineering Development Center (AEDC): The T&E Support Project at AEDC, located at Arnold TN, provides the test infrastructure overhead support to operate the largest

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Program Element: #0605807F Budget Activity: #6 -Defense-wide
PE Title: Test and Evaluation Support Mission Support

complex of ground test facilities in the free world (includes transonic, supersonic, and hypersonic wind tunnels; rocket motor and turbine engine test cells; space environmental test chambers, hyperballistic ranges; and other specialized facilities). This project funds unique expenses such as plant upkeep; electricity and natural gas for heating, cooling, and lighting of 284 buildings (2,439,361 square feet); and the Tennessee Valley Authority demand charge for the test workload in support of the AEDC Applied Technology program. However, unlike other projects in this PE, AEDC is Air Force managed and contractor operated. Thus, this project's labor forces are civilian contractor. In order to provide the necessary technological/test expertise to weapon system test programs it is critical to maintain a core group of this work force. Together, these resources posture at the Center to support aircraft, missile, and space systems test at simulated flight conditions; and fund a technology program to develop advanced testing techniques and instrumentation required to test tomorrow's aerospace systems. Overall, the program's prime objective is to retain the bedrock resources that have enabled AEDC to contribute to the development of virtually all of the nation's top priority aerospace programs including ICBMs; aircraft like the F-117 Stealth Fighter, the B-2 Stealth Bomber, and the F-22 Fighter; missiles such as the Patriot and the Tomahawk cruise missile; and space systems to include the Space Shuttle and the Global Positioning System (GPS) satellite.

(U) FY 1992 Accomplishments:

- (U) Continued test infrastructure overhead support including a \$1.8M increase to offset inflation from FY91.
- (U) Funded 163 civilian personnel and 3192 contractors, as well as civilian labor associated expenses. Funded mandatory pay raise for operating contractors. (\$4.0M)
- (U) Provided funding for an increase in the award fee pool for the operating contractor. (\$0.4M)
- (U) Provided additional funds for hazardous waste disposal program to comply with State and Federal regulations. (\$0.5M)
- (U) Provided support funding for the T-3 Engine Test Cell modification IOC to include checkout and certification of the cell/facility. (\$1.1M)
- (U) Provided funding for 16 Foot Supersonic Wind Tunnel (16S) including advanced airframe model development. (\$1.8M)
- (U) Provided funding for the High Temperature Lab Addition (HTLA) to expand the arc heater test capability to perform advanced technology investigations. (\$1.8M)
- (U) Funded DECADE facility support for assessing x-ray radiation effects on space-based assets and missile systems. (\$0.3M)
- (U) Began work on day-to-day maintenance deferred in recent years; reduces potential program delays and repair costs due to test facility breakdowns. (\$0.3M)
- (U) Installed Test Unit Support System (TUSS) to streamline jet engine propulsion testing. (\$1.6M)

(U) FY 1993 Planned Program:

- (U) Continue test infrastructure overhead support to enable testing for classified programs, and the F-15, F-16, F-18E/F, F-22, SDIO and other unclassified programs.
- (U) Program Content changes:
 - (U) Fund inflation on materials and services from FY92 to FY93. (\$1.4M)
 - (U) Fund contract mandated pay raises for operating contractor work force. (\$4.2M)

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- (U) Fund annualized civilian pay raises. (\$0.3M)
 - (U) Defer funding for repair and refurbishment of old, highly used test equipment.
 - (U) Continue support to DECADE facility and increase funding for test technology to improve productivity and enable meeting near-term and future customer test needs. (\$2.2M)
 - (U) Initiate installation of Aeropropulsion System Test Facility (ASTF) icing capability to support advanced aircraft test needs. (\$0.8)
 - (U) Continue installation of TUSS to streamline jet engine propulsion testing. (\$1.4M)
- (U) FY 1994 Planned Program:
- (U) Continue test infrastructure overhead support to enable testing for classified programs, and the F-15, F-16, F-18E/F, F-22, B-1B Conventional Stores Certification, SDIO and other unclassified programs.
 - (U) Program content changes include the following:
 - (U) Fund inflation on materials and services from FY93 to FY94. (\$2.0M)
 - (U) Fund Operating Contractor work force pay raises. (\$4.4M)
 - (U) Fund Operations and Maintenance for new facilities: High Temperature Lab Addition (\$0.4M), Large Rocket Test Facility (\$2.0M), and Improved Ballistic Range (\$0.5M).
 - (U) Increase funds for deferred day-to-day maintenance of 30-50-year-old test equipment (\$0.4M), and emphasize funding for replacement/refurbishment of obsolete, high-maintenance test equipment in great demand to support of F-18, F-22 and classified test programs. (\$2.2M)
 - (U) Continue to support DECADE facility, and increase funding for test technology and long range planning. (\$2.7M)
 - (U) Procure scientific computing equipment and test data storage to meet computing requirements of programs such as the F-18 and F-22. (\$2.8M)
 - (U) Provide for ASTF icing capability to support icing test needs of advanced aircraft such as the F-22. (\$1.5M)
 - (U) Complete installation of TUSS to streamline jet engine propulsion testing. (\$0.9M)
- (U) Work Performed By: Primary contractors performing test support include Sverdrup Technology, Inc., Calspan Corporation, and SSI Services, Inc.
- (U) Related Activities:
- (U) PE 0605878F, Maintenance and Repair; PE 0605876F, Minor Construction; and PE 0605856F, Environmental Compliance. (Property maintenance and environmental compliance)
 - (U) PE 0605896F, Base Operations RDT&E. (Base Operating support)
 - (U) PE 0604759F, Major T&E Investment. (Technical capability Improvement and Modernization)
 - (U) PE 0604940D, Central Test & Evaluation Investment Program. (T&E Investments for new tri-service test capabilities)
 - (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.
- (U) Other Appropriation Funds (\$ in Thousands): Not applicable.
- (U) International Cooperative Agreements: Not applicable.

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Program Element: #0605807F Budget Activity: #6 -Defense-wide
PE Title: Test and Evaluation Support Mission Support

2. (U) Project 06ZA, Air Force Development Test Center (AFDTC): The T&E Support project at AFDTC, located at Eglin AFB, FL, provides the test infrastructure overhead support for non-nuclear air armaments (including aircraft guns, ammunition, bombs, and missiles) and EC systems for DOD and allied forces. AFDTC provides multi-service climatic simulation test support and determination of electromagnetic/electro-optical weapon signature using climatic test chambers, Preflight Integration of Munitions and Electronic Systems (PRIMES) facility, and Guided Weapons Evaluation Facility (GWEF), and the Electromagnetic Test Environment (EMTE) open air Electronic Combat test range. AFDTC operates a highly instrumented land/water range test complex in the Gulf area. In addition, this PE funds AFDTC's overhead costs for checkout, training and currency flying for aircrews supporting the test mission. Funding pays salaries for a government work force of approximately 1,150 civilians responsible for maintaining AFDTC's role as center of expertise in electronic combat and air-to-air/air-to-surface munitions integrated test and evaluation. This PE also funds operations and maintenance contracts employing a workforce of approximately 1,070 people necessary to support testing on this 724 square mile land and 86,500 square mile water range.

(U) FY 1992 Accomplishments:

- (U) Continued test infrastructure overhead support for AMRAAM, SFW, JOINT STARS, ATARS, major electronic combat systems, and SEEK EAGLE testing.
- (U) Provided \$3.6M increase for inflation and fuel adjustments.
- (U) Provided \$5.5M for manpower realignment from MFP 7 O&M dictated by the conversion of Eglin AFB from the Munitions Systems Division (MSD) to the Air Force Development Test Center (AFDTC).
- (U) Provided \$1.0M to convert military positions to civilian manpower authorizations.
- (U) Increased scope of range contract to provide a full year operation of three threat radar simulators, first full year of GWEF operations to include infrared guided weapon performance evaluation capability, and mandated Department of Labor (DOL) contractor work increases of \$1.7M.

(U) FY 1993 Planned Program:

- (U) Continue test infrastructure overhead support for major electronic combat test programs, AMRAAM, JOINT STARS, ATARS, and SEEK EAGLE testing.
- (U) Fund equipment depot level reparable. (\$14.4M)
- (U) Program Content Changes:
 - (U) Fund civilian pay raise. (\$1.4M)
 - (U) Postpone purchase of infrared range equipment replacements and refurbishment of obsolete, high maintenance equipment supporting critical EC test assets. (-\$3.6M) (deferred from FY92)
- (U) Fund inflation. (\$1.0M)
- (U) Reduce manning level of O&M Contract. (-\$1.5M)

(U) FY 1994 Planned Program:

- (U) Continue test infrastructure overhead support for major electronic combat test programs, AMRAAM, JOINT STARS, ATARS, and SEEK EAGLE testing.
- (U) Fund equipment depot level reparable. (\$12.9M)

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- (U) Program Content Changes:
 - (U) Delay restructure of the range support contract for new threat systems, additional GWEF capabilities support, and maintenance support required for newer, complex computer-controlled simulators. (-\$3.5M)
 - (U) Suspend the replacement/refurbishment of obsolete, high-repair equipment supporting electronic combat test assets, deferred from previous years. (-\$2.4M)
 - (U) Fund inflation. (\$1.0M)
 - (U) Reduce test capabilities by eliminating marine operations (-\$.3M) and defer equipment replacement (-\$.5M).

(U) Work Performed By: In-house work force and VITRO Services, Ft. Walton Beach, FL.

(U) Related Activities:

- (U) PE 0605878F, Maintenance and Repair, PE 0605876F, Minor Construction and 0605856F, Environmental Compliance. (Property maintenance and environmental compliance)
- (U) PE 0605896F, Base Operations RDT&E. (Base operating support)
- (U) PE0604759F, Major T&E Investment. (Technical capability Improvement and Modernization)
- (U) PE0604256F, Range Improvement Program (RIP). (Range improvement for development of electronic combat threat systems, operations/support)
- (U) PE0604940D, Central Test & Evaluation Investment Program. (T&E Investments for new tri-service test capabilities)
- (U) PE0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 06YA, Air Force Flight Test Center (AFFTC): The T&E Support project at the AFFTC, located at Edwards AFB, CA, provides test infrastructure overhead support for development and operational test and evaluation support for aircraft and aircraft systems, aerospace research vehicle, unmanned miniature vehicle, cruise missiles, parachute delivery/recovery systems, and cargo handling systems. Recovery support and engineering evaluation is provided to the Space Shuttle program and other transatmospheric vehicles. AFFTC operates two instrumented ranges: the Edwards Flight Test Range and the Utah Test and Training Range (funded in FY92/93 with PE 0708019F in the O&M appropriation). The Center consists of the Air Force Test Pilot School (AFTPS); one Test Wing consisting of two Test Groups, ten Test Squadrons, five Maintenance Squadrons, two Range Squadrons, and one Supply Squadron; one Support Wing; and Center level command and staff functions. Funding supports major generic ground test capabilities such as the Integrated Facility for Avionic Simulation Tests (IFAST), Test and Evaluation Mission Simulator (TEMS), and the Benfield Anechoic Facility (BAF) (formerly known as the Air Force Anechoic Facility). In addition this PE funds AFFTC's overhead costs for checkout, training and currency flying for aircrews supporting the test mission and the general overhead costs of the test organizations associated with providing test program support, as well as the total costs of the AFTPS. With

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PE Title: Test and Evaluation Support

Mission Support

the transfer of Depot Level Reparables (DLR) to this account in FY92, AFFTC funding will increase due to the many varying mission aircraft requiring special ground test equipment. These DLR's include range instrumentation support, Special Purpose Recoverables Authorized to Maintenance (SPRAM), and IFAST instrumentation. Funding pays for a government and contractor work force responsible for providing test support consistent with AFFTC's role as center of expertise for aerodynamic/avionics systems test and evaluation. Also included are operations and maintenance contracts necessary to support testing on the range.

(U) FY 1992 Accomplishments:

- (U) Provided test infrastructure overhead to support the B-1B, B-2, F-16, F-15, F-15E, C-17, F-22, AFTI/F-16, Gunship/ Combat Talon II, DIRS, UARS, and classified programs.
- (U) Program content changes included the following:
 - (U) Inflation. (\$2.4M)
 - (U) Military to civilian manpower conversion. (\$1.0M)
 - (U) BAF operation. (\$1.4M transferred from PE 0604735)
 - (U) General Support Facility upgraded -- both airframe and simulation systems. Areas included: Computer Aided Design and Air Frame Systems Modernization. (\$1.4M)
 - (U) AFTPS multi-engine curriculum (C-141/C-23A) upgrade. (\$1.2M)

(U) FY 1993 Planned Program:

- (U) Continue test infrastructure overhead support enabling testing of the B-1B, B-2, F-16, F-15, F-15E, F-22, AFTI/F-16, C-17, Gunship/Combat Talon II, and classified programs.
- (U) Program content changes include the following:
 - (U) Inflation from FY92 to FY93. (\$2.4M)
 - (U) Annualized pay raises. (\$1.0M)
 - (U) Fund implementation of JOCAS II and provide hardware and software for management measurement systems. (\$1.2M)
 - (U) Defer military to civilian manpower conversion. (-\$1.4M)
- (U) Continue program of limited replacement and/or modernization of aging range, shop, air frame, and simulation systems and equipment at FY92 levels. (\$2.1M)
- (U) Fund depot level reparables. (\$18.1M)
- (U) Continue BAF operation and support as avionics intensive weapon systems testing increases in both ground facilities and during flight. (\$4.6M)
- (U) Support testing of classified programs. (Classified programs require more extensive infrastructure to provide mandatory security.)
- (U) First phase of the 4950TW move to Edwards AFB including transfer of the T-39's and C-141's.

(U) FY 1994 Planned Program:

- (U) Continue test infrastructure overhead to support the B-1B, B-2, F-16, F-15, F-15E, F-22, AFTI/F-16, Gunship/Combat Talon II, C-17, and classified programs.
- (U) Program content changes include the following:
 - (U) Inflation. (\$2.7M)
 - (U) Defer SETA contract efforts addressing master plans, systems engineering for range development, and management information systems development. (-\$1.3M)

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PE Title: Test and Evaluation Support Mission Support

- (U) Defer BAF equipment maintenance, chamber upgrades, and threat systems programming. (\$-1.0M)
- (U) Postpone replacement/modernization of aging range, shop, airframe, simulation systems, networks, and fiber optics equipment in order to cover higher-priority operating costs.
- (U) Continue BAF operation and support as testing of avionics intensive weapon systems increases in both ground test facilities and in flight. (\$5.8M)
- (U) Fund military to civilian manpower position conversions. (\$1.0M)
- (U) Fund ground support equipment depot level reparable. (\$1.8M)
- (U) Complete the move of the 4950TW to Edwards AFB with the final flight of the Advanced Radar Testbed in March 1994.
- (U) Install weapons systems computer for advanced aircraft data reduction. (\$0.8M)
- (U) Complete technical order documentation of 4950TW test aircraft. (\$1.5M)

(U) Work Performed By: Primary contractor performing test support is Computer Science Corporation (CSC), Lancaster, CA.

(U) Related Activities:

- (U) PE 0605878F, Maintenance and Repair; PE 0605876F, Minor Construction; and PE 0605856F, Environmental Compliance. (Property maintenance and environmental compliance)
- (U) PE 0605896F, Base Operations RDT&E. (Base operating support)
- (U) PE 0604759F, Major T&E Investment. (Technical capability improvement and modernization)
- (U) PE 0604256F, Range Improvement Program (RIP). (Range improvement for development of electronic combat threat systems, operations/support)
- (U) PE 0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 06UC, 4950th Test Wing (4950 TW): The T&E Support Project at the 4950th Test Wing, Aeronautical Systems Center, Wright-Patterson AFB, OH, provides the test infrastructure overhead support for flight tests of aircraft and airborne systems; and supports space vehicle data tracking for Air Force Space Command (AFSPACOM), other DOD agencies, and the National Aeronautics and Space Administration (NASA). The Wing operates Air Force Material Command's large testbed aircraft and flight test aircraft modification facility and provides limited manufacturing support, on a non-interference basis with research and development, to Air Force and other Department of Defense components through the use of computer aided design/computer aided manufacturing (CAD/CAM). Flight tests range from evaluations of electronic systems such as radar, navigation, and Command, Control and Communications to aerodynamic and structural evaluations of highly modified RDT&E aircraft. Staging out of US and overseas bases, the Advanced Range Instrumentation Aircraft (ARIA) fleet of eight aircraft provide telemetry support for the NASA and DOD missile launches. In addition, this PE funds the

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4950TW's overhead costs for checkout, training and currency flying for aircrews supporting the test mission. Funding also supports a government work force of 838 civilians responsible for maintaining 4950th TW's role as center of expertise in avionics sub-systems, CAD/CAM, and testing commercial aircraft.

(U) FY 1992 Accomplishments:

- (U) Continued test infrastructure overhead support for ARIA and systems flight test support to DOD laboratory/ acquisition programs including increases of \$3.2M for deferred equipment replacements, inflation and fuel cost adjustments.
- (U) Continued ARIA test instrumentation, Computer Aided Engineering (CAE), Computer Aided Manufacturing (CAM) and Computer Integrated Manufacturing (CIM) for fabrication and modification in support of flight test.
- (U) Purchased initial spare test equipment (deferred from FY91) for Cruise Missile Mission Control Aircraft (CMMCA) which will become operational with test completion on second production system. (\$2.3M)
- (U) Updated the and EC-18B modification drawing documentation to government specifications (deferred from FY90 and FY91) for more efficient support to existing aircraft test equipment. (\$1.2M)
- (U) One Sonobuoy Missile Instrumentation Location System (SMILS) entered initial operational capability.
- (U) Continued work on ECCM/ARTB aircraft. (\$2.0M)

(U) FY 1993 Planned Program:

- (U) Continue test infrastructure overhead support for ARIA SMILS and flight test support with increase for fuel adjustment and inflation. (\$2.0M)
- (U) Continue upgrade of obsolete shop, manufacturing and computer equipment in support of flight test. (\$.5M)
- (U) Continue documentation update of Test Wing aircraft. (\$1.5M)
- (U) Complete ECCM/ARTB and begin full support funding for the new test capability on a C-141 aircraft. (\$1.4M)
- (U) Fund ground equipment depot level reparable. (\$5.7M)
- (U) Begin first phase of move to Edwards AFB with transfer of T-39 and C-141 aircraft.
- (U) Continue replacement and upgrade of outdated equipment on ARIA aircraft (\$.3M).

(U) FY 1994 Planned Program:

- (U) Funding and responsibility for flight test and test support operations transferred to AFFTC. Aircraft move complete by April 1994.
- (U) Install ventilation/exhaust system in DMMF. (\$0.6M).
- (U) Conduct temporary and prototype aircraft modifications.
- (U) Provide support for research and development fabrication.
- (U) Support small lot manufacturing requirements.
- (U) Demonstrate selected technology and transfer to ALCs and the private sector.

(U) Work Performed By: In house workforce.

(U) Related Activities:

- (U) PE 0604759F, Major T&E Investment. (Technical capability improvement and modernization)
- (U) PE 0604940D, Central Test & Evaluation Improvement Program. (T&E Investments for new tri-service test

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Program Element: #0605807F Budget Activity: #6 -Defense-wide
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capabilities)

- (U) PE 0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

5. (U) Project 1013, Utah Test and Training Range (UTTR): The T&E Support Project at UTTR, located at Hill AFB, UT, provides test infrastructure overhead support for development and operational test and evaluation of aircraft and aircraft systems, unmanned vehicles, and cruise missiles. Project 1013 also provides overhead support for multi-Service training programs at UTTR. The overall UTTR project includes operation and maintenance, procurement, and manpower funding to support test facilities and equipment. Funding provides for planning, air traffic control, communications data collection, processing and analysis, and range safety. UTTR also has a variety of ground target and test stands to support training and test communities. This effort is a zero base transfer from PE 0708019F starting in FY 1994.

(U) FY 1992 Accomplishments:

- (U) This effort was supported in PE 0708019F.

(U) FY 1993 Planned Program:

- (U) Last year in which effort will be supported in PE 0708019F

(U) FY 1994 Planned Program:

- (U) Provide test infrastructure overhead to support testing of cruise missiles, unmanned aerial vehicles, and classified programs.
- (U) Continue support for live fire testing and air-to-air and air-to-ground munitions testing.

(U) Work Performed By: Computer Sciences Corp.

(U) Related Activities:

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ In Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-Defense Wide
Mission Support

A. (U) RESOURCES (\$ In Thousands):

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Development Planning	<u>8,697</u>	<u>9,611</u>	<u>9,796</u>	<u>Continuing</u>	<u>TBD</u>
	8,697	9,611	9,796	Continuing	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element is dedicated to funding pre-Milestone I analyses and studies to determine the operational need for a new acquisition program. These candidate analyses and studies identify Air Force operational deficiencies and recommend cost effective solutions to solve them. They include mission area assessments, mission needs analysis, concept development, Cost and Operational Effectiveness Analysis (COEA), and Operational Requirement Document (ORD) definition. Mission area assessment and mission need analysis are required to identify and define deficiencies. The deficiencies must be mission relevant, relating directly to an assigned task, role, mission that cannot be performed efficiently, or in a cost effective and timely manner. If deficiencies are identified, they are documented in a Mission Need Statement (MNS). The MNS is needed for concept studies approval (MS 0). After MS 0, concept development, COEA, and ORD definition are needed at MS I. There is no unnecessary duplication of effort within the Air Force or DoD.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

(U) Development Planning: Program content decreased in FY 1994 due to Congressional action while the Air Force is transitioning to the new DoD 5000 series regulations which mandate that a full range of analyses and studies be conducted to validate operational deficiencies. A reassessment of Air Force priorities is underway which may result in increased funding requirements. In the past, new acquisition programs were initiated at acquisition Milestone 0 and funding support was provided for concept development within individual acquisition programs. The new DoD policy mandates that a new acquisition program will not be initiated until Milestone I. This is a significant change and has a substantial impact on the pre-Milestone I process. Further, it enables the USAF to make cost effective, operational decisions on whether to continue supporting existing systems or developing and producing an improved capability for the operational forces.

(U) FY 1992 Accomplishments:

- (U) Completed concept development for F-15 and F-16 aircraft maintenance skills training with potential applications to other aircraft.
- (U) Completed Army/Air Force mission need analysis of 6 alternatives for emergency release of cargo parachutes during airdrop operations--determined three

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-Defense Wide
Mission Support

A. (U) RESOURCES (\$ In Thousands:

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Development Planning	<u>8,697</u>	<u>9,611</u>	<u>9,796</u>	<u>Continuing</u>	<u>TBD</u>
	8,697	9,611	9,796	Continuing	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT:

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C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

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(U) FY 1992 Accomplishments:

- (U) Completed concept development for F-15 and F-16 aircraft maintenance skills training with potential applications to other aircraft.
- (U) Completed Army/Air Force mission need analysis of 6 alternatives for emergency release of cargo parachutes during airdrop operations--determined three

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Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-Defense Wide
Mission Support

- feasible alternatives and MNS approved.
- (U) Completed assessment of promising technologies to enhance future composite wing operations and support.
 - (U) Investigated potential near term munitions modifications to maximize effectiveness and affordability.
 - (U) Continued mission area assessment and mission needs analysis of potential operational theater missile defense concepts to include the integration of potential off-board sensors, JSTARS as an IR sensor platform and communication platform, and deployment of an autonomous air vehicle in attack operations.
 - (U) Expanded development of information flow analysis tool to examine the new tanker missions assigned to Air Mobility Command.
 - (U) Continued mission area assessment to establish assessment capability for hostile target identification--determine effective, high payoff technologies.
 - (U) Continued mission area assessment tool development of tactical satellite simulator--evaluated potential operational concepts.
 - (U) Continued concept development to include a review and analysis of the battlefield weather observing and forecasting information requirements.
 - (U) Initiated mission area assessment of fighter and bomber initial pilot training.
 - (U) Initiated mission area assessment and identified promising concepts to provide simultaneous jam resistant intraflight and interflight aircraft comm/data link.
 - (U) Initiated mission area assessment of long term strategic offense needs.
 - (U) Initiated identification and evaluation of key technologies and architectures to support Integrated Satellite Control System.
- (U) FY 1993 Planned Program:
- (U) Complete assessment of Integrated Satellite Control System architectural elements--assists USSPACECOM in selection of optimal architecture.
 - (U) Complete evaluation of combining standard and tactical cargo loader capabilities into a single replacement.
 - (U) Complete concept development and cost tradeoff analysis of options for protecting passengers on airlift aircraft from smoke and toxic fumes.
 - (U) Continue mission needs analysis for next generation air-to-surface munitions.
 - (U) Continue concept development and evaluation of theater missile defense--operational concepts include AWACS long range surveillance, JSTARS improvements to assist attack ops, and autonomous air vehicle participation.
 - (U) Continue mission needs analysis--refine theater campaign and mission level scenarios and evaluate mission effectiveness of fighter forces.
 - (U) Continue development of detailed information flow model of Air Mobility Command to identify mission area deficiencies.
 - (U) Continue Army/Air Force development of theater airlift assessment capability.
 - (U) Continue mission area assessment to refine assessment capability for hostile target identification--determine effective, high payoff technologies.
 - (U) Continue development of assessment capability to identify operational tactical satellites options to support battlefield commander.
 - (U) Continue concept development and COEA of existing weather prediction models to support Tactical Forecast System and determine operational utility of

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Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-Defense Wide
Mission Support

- fusing meteorological satellite data with other meteorological data.
- (U) Continue mission needs analysis for fighter and bomber initial pilot training.
 - (U) Continue concept development and evaluation of potential alternatives to provide simultaneous jam resistant aircraft intra-flight and inter-flight comm.
 - (U) Initiate mission area assessment and mission needs analysis of detection and destruction of enemy mobile targets--Desert Storm lessons learned.
 - (U) Initiate analysis of analytical deficiencies to identify and evaluate specific analytical tools and techniques required to improve operational effectiveness and cost analysis tools to determine the operational need for a new acquisition.
 - (U) Initiate mission area assessment and mission needs analysis of space support to battlefield commanders--Desert Storm lessons learned.
 - (U) Initiate mission area assessment and mission needs analysis of Suppression of Enemy Air Defense forces--identify potential alternatives.
 - (U) Initiate mission area assessment of regional threats to large aircraft -- supports documented deficiencies in Air Combat Command, Air Mobility Command, and Air Force Special Operations Command.
 - (U) Initiate mission area assessment capability to identify and evaluate options to assist third world counterinsurgency/counternarcotics operations.
 - (U) Initiate mission area assessment of space lift support to warfighters.
 - (U) Initiate mission area assessment capability to identify and evaluate options for bomb damage assessment--Desert Storm lessons learned.
 - (U) Initiate mission area assessment capability to identify and evaluate options for real-time intelligence gathering for the battlefield commander.
 - (U) Initiate mission area assessment capability to identify and evaluate cost effective options for future aeromedical evacuation.
 - (U) Perform concept development and COEA for joint US-Canadian air defense operational requirements--identify upgrade/replacement options.
 - (U) Initiate mission area assessment capability to identify C4I options for theater battle management--builds on Air Mobility Command's C4I analysis.
 - (U) Initiate mission area assessment capability to identify and evaluate future communication/dissemination structures to provide force support.
- (U) FY 1994 Planned Program:
- (U) Continue to identify operational deficiencies through Mission Area Assessments and Mission Needs Analysis.
 - (U) Complete development of detailed information flow model of Air Mobility Command to identify mission area deficiencies.
 - (U) Complete concept development and COEA for most promising potential alternatives to provide simultaneous jam resistant aircraft intra-flight and inter-flight comm.
 - (U) Complete mission area assessment capability to identify operational tactical satellites options to support battlefield commander.
 - (U) Continue mission needs analysis for next generation air-to-surface munitions.
 - (U) Continue concept development and COEA on theater missile defense concepts.
 - (U) Continue mission area assessment capability to identify and evaluate options for hostile target ident--transition selected options to existing programs.

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Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-Defense Wide
Mission Support

- (U) Continue concept development and COEA of existing weather prediction models to support Tactical Forecast System and determine operational utility of fusing meteorological satellite data with other meteorological data.
 - (U) Continue mission needs analysis for fighter and bomber initial pilot training.
 - (U) Continue concept development for options to defeat regional threats to large aircraft--a potential threat is shoulder-launched IR guided missiles.
 - (U) Continue mission needs analysis to identify viable options for bomb damage assessment--Desert Storm lessons learned.
 - (U) Continue mission area assessment capability to identify C4I options for theater battle management--builds on Air Mobility Command's C4I analysis.
- (U) Work Performed By: Efforts typically use in-house analysts and multiple contractors to perform detailed technical assessments to include mission area assessment, mission need analysis, concept development, COEA. In-house analysts include: Aeronautical Systems Division, Wright-Patterson AFB OH; Electronic Systems Division, Hanscom AFB MA; Human Systems Division, Brooks AFB TX; and Space Systems Division, Los Angeles AFB CA. Examples of contractors are: Ball Systems Engineering, Martin Marietta, Grumman, Lockheed, Logicon, General Dynamics, Northrop, Sverdrup, Battelle, Techolote, Nichols Research, Draper, Quest Technology, and Boeing.
- (U) Related Activities:
- (U) Projects funded by this program element evaluate integration of emerging technology into candidate concepts.
 - (U) There is no unnecessary duplication of effort within the Air Force or DoD.
- (U) Other Appropriation Funds (\$ in Thousands): Not Applicable.
- (U) International Cooperative Assessments: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605856F
PE Title: Environmental Compliance

Budget Activity: #6-Defense-Wide
Mission Support

A. (U) RESOURCES (\$ In Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY1993</u> <u>Estimate</u>	<u>FY1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
6606EC, Environmental Compliance	*0	12, 014	39,575	Cont	TBD

*FY92 and prior, funded in PE0605894F

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential Environmental Compliance (EC) services at three Air Force Materiel Command Major Range and Test Facility Bases (MRTFBs): Eglin AFB, FL; Edwards AFB, CA; and Arnold AFB, TN. The account provides funds for Operations and Services (O&S), Level I, (currently out of compliance with federal, state or local environmental law) Level II (pending compliance deadline in future) and Level III (not currently under law, but good management practice) (recurring and non-recurring) requirements to comply with environmental protection and compliance laws i.e., hazardous waste management and disposal; upgrade and removal of underground storage tanks; air and water pollution; asbestos abatement and disposal; polychlorinated biphenyl elimination and other toxic substances. Also funds for pollution sampling and analysis, studies, testing and inspections; permits and fees; National Environmental Policy Act (NEPA) actions; and natural, cultural and historic land management.

C. (U) JUSTIFICATION FOR PROJECTS GREATER THAN \$10.0 MILLION IN FY 1994:

- (U) Project 6606EC, Environmental Compliance (EC): Project funds EC projects and resources "must pay" operations and services to comply with environmental protection and compliance laws and regulations on environmental hazardous waste; hazardous waste disposal; underground storage tanks; air pollution; asbestos abatement and removal; other toxins; pollution sampling, studies, testing, inspection and repair of processing equipment; natural, cultural and historic land management and related administration.
- (U) FY 1992 Accomplishments:
 - (U) Not Applicable.
- (U) FY 1993 Planned Program:
 - (U) \$6.8M funding in FY93 will support only a portion of critical "must fund" Operations and Services (O&S) requirements to meet day to day operations.
 - (U) \$5.2M funds a small amount of Level I (out of compliance) items. Several Level I items will not be accomplished and will leave installations subject to enforcement action by regulators. Level II requirements will also not be accomplished in time to meet compliance deadlines, which will result in them becoming Level Is in subsequent fiscal years.
- (U) FY 1994 Planned Program:
 - (U) \$21M in FY94 is for essential O&S requirements.
 - (U) \$12M will fund projects classified as Level I (currently out of compliance with federal, state or local environmental law).

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Program Element: 0605856F
PE Title: Environmental Compliance

Budget Activity: 6-Defense-Wide
Mission Support

- (U) \$6.6M will fund projects classified as Level II (pending compliance deadline in future).
- (U) No funding will be available to fund Level III (not currently under law, but good management practice) requirements.
- (U) The increased funding in FY94 will help alleviate the backlog of Level I & II requirements from FY93, especially upgrade of underground storage tanks, oil and water separators, and hazardous waste accumulation sites, and upgrade storm, sanitary and sewer systems, commence control of air emissions per latest Clean Air Act amendments and state implementation plans. Funds cleanup of hazardous waste sites, provide cultural resources protective measures, endangered species controls and natural resources conservation.
- (U) Work Performed By: In-house work force; Conerly Construction, FL; Lord & Son Construction, FL; SSI, PA; Sverdrup Inc, MI; Cal Span Corp, OH; Steven's Construction, CA; Foote Corp, CA.
- (U) Related Activities:
 - (U) PE0605807F, Test and Evaluation Support (TES), provides the mission funds for civilian personnel at Arnold AFB since mission support consumes almost all personnel efforts.
 - (U) There is no unnecessary duplication of effort within the Air Force of the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605863F Budget Activity: #6-Defense-wide
 PE Title: RDT&E Aircraft Support Mission Support

A. (U) RESOURCES (\$ in Thousands)

Project	FY 1992	FY 1993	FY 1994	To	Total
<u>Number & Actual</u>	<u>Estimate</u>	<u>Estimate</u>		<u>Complete</u>	<u>Program</u>
<u>Title</u>					
2111 Air Force Development Test Center (AFDTC)	8,957	9,557	8,038	Cont	TBD
2112 Air Force Flight Test Center (AFFTC)	17,207	16,312	19,357	Cont	TBD
2114 4950th Test Wing	<u>17,339</u>	<u>15,778</u>	<u>14,762</u>	<u>Cont</u>	<u>TBD</u>
Total	43,503	41,647	42,157	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The RDT&E aircraft support program provides resources for maintaining Air Force Materiel Command assigned test and test support coded aircraft which are included as a portion of the Department of Defense Major Range and Test Facility Base (MRTFB). This program supports 178 RDT&E aircraft of 19 different types. These include a multitude of configurations, with many prototype, preproduction, and extensively modified/instrumented one-of-a-kind aircraft. Funds pay for depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the Aircraft System Managers; engine overhauls; depot-provided area assistance; and assorted ground support equipment overhauls that require reimbursement.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project: 2111. Air Force Development Test Center (AFDTC): The Air Force Development Test Center (AFDTC), Eglin AFB FL, is the primary USAF organization responsible for non-nuclear munitions armament development. AFDTC accomplishes RDT&E and initial acquisition of USAF non-nuclear munitions; is the USAF focal point for munitions integration in aeronautical systems; and conducts USAF weapons effectiveness testing and electromagnetic warfare/electronic combat testing. AFDTC currently has the following types and quantities of test/test support aircraft assigned: NC-130A(1); RF-4C(2); F-15A(2); F-15B(3); F-15C(1); F-15D(1); F-15E(2); F-16A(3); F-16B(5); F-16C(5); F-16D(1); F-111E(2); F-111F(2); UH-1N(2); and AT-38B(2). Total aircraft assigned: 34. The two AT-38Bs provide test support to programs at Holloman AFB, NM.

(U) FY 1992 Accomplishments:

- (U) PDM was accomplished on one C-130A and one F-15A. On Condition Maintenance (OCM) was accomplished on one UH-1N.
- (U) Analytical Condition Evaluation (ACE) was accomplished on two UH-1Ns. Five F-16s went into Ogden Air Logistics Center for update and modification.
- (U) Four Special Purpose Vehicles (three Semi-Tank Trailers and one Loraine Crane) were overhauled.
- (U) Airframe Mounted Accessory Drive repair was performed on one F-15B.

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Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide
Mission Support

- (U) Eglin flew 6,393 flying hours which generated corresponding engine overhauls and exchangeable requirements.
- (U) FY 1993 Planned Program:
 - (U) PDM will be accomplished on two RF-4Cs, one F-15B, and one F-111E.
 - (U) The annual Analytical Condition Evaluation (ACE) will be done on one UH-1N and On Condition Maintenance (OCM) will be done on one UH-1N..
 - (U) Twelve Special Purpose Vehicles (one R-9, two P-12s, and nine MB-4s) will be overhauled.
 - (U) Eight F-16 F100-220E engines will be input for modification/update into Ogden Air Logistics Center.
 - (U) Eglin is projecting 5,630 flying hours which will generate corresponding engine overhaul requirements.
- (U) FY 1994 Planned Program:
 - (U) PDM will be accomplished on one F-15D.
 - (U) F-16 miscellaneous work is expected to cost \$1.0M.
 - (U) Three F-16 F100-220E engines will be input for modification/update.
 - (U) The annual Analytical Condition Evaluation (ACE) will be done on two UH-1Ns.
 - (U) Five Special Purpose Vehicles (one P-12, two R-9s, and two P-8s) will be overhauled.
 - (U) Eglin is projecting 5,900 flying hours which will generate corresponding engine overhaul requirements.
- (U) Work Performed By: Depot level maintenance is performed either organically by the Air Force Materiel Command (AFMC) Air Logistic Centers (ALCs) or contractually with the ALCs negotiating/administering the contract. Organically, work is performed at all five AFMC ALCs. Contractually, work is performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; PEMCO, Birmingham, AL; and General Dynamics, Ft. Worth, TX.
- (U) Related Activities:
 - (U) PE 0605807F, Test and Evaluation Support. (Test aircraft operation).
 - (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.
- (U) Other Appropriation Funds: Not applicable.
- (U) International Cooperative Agreements: Not applicable.
- 2. (U) Project: 2112, Air Force Flight Test Center (AFFTC): The Air Flight Test Center (AFFTC), Edwards AFB CA, conducts and supports test of aircraft and aircraft systems, aerospace research vehicles, remotely piloted vehicles, cruise missiles and parachute delivery/recovery systems. Support of AFFTC aircraft located at the 514th Test Squadron at Hill AFB, UT, is also funded within this project. The AFFTC currently has the following types and quantities of test/test support aircraft assigned: A-37B(4); AC-130U(3); B-1B(2); B-2A(5); B-52G(1); B-52H(1); C-17A(6); C-23(3); DC-130A(1); HC-130H(1); MC-130H(2); NC-130B(1); NC-130H(3); C-135C(1); WC-135B(1); F-15A(4); F-15B(6); F-15D(2); F-15E(3); F-16A(8); F-16B(16); F-

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Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide
Mission Support

16C(8); F-16D(2); HH-1H(4); UH-1N(2); MH-60G(3); and T-38A(23). Total aircraft assigned: 114. These aircraft include special use AFMC aircraft not based at Edwards AFB.

(U) FY 1992 Accomplishments:

- (U) PDM was accomplished on one C-130B and one F-15A.
- (U) Analytical Condition Evaluation (ACE) was done on four HH-1Hs and two UH-1Ns.
- (U) Six F-16s input for update/modification.
- (U) Modification/update was accomplished on one NC-130H.
- (U) Five Special Purpose Vehicles (38-cylinder compressed gas trailers) where overhauled.
- (U) Edwards AFB and Hill AFB flew 24,981 hours which generated corresponding engine and exchangeable overhaul requirements.

(U) FY 1993 Planned Program:

- (U) PDM will be accomplished on one B-1B, and two F-15As.
- (U) Analytical Condition Evaluations (ACE) will be done on four HH-1Hs, one UH-1H, and three MH-60Gs.
- (U) Twelve F-16s will be input for modifications.
- (U) Seventeen Special Purpose Vehicles (ten compressed gas trailers, three MB-4s, one R-9, one P-8, one P-2, and a 10K fork lift) will be overhauled.
- (U) Four T-38s will be input for modification/update.
- (U) Wing removal/installation on NC-130B is expected to cost \$229K.
- (U) Additional paint requirements for five aircraft is expected to cost \$75K at the Corrosion Control Facility.
- (U) Edwards AFB and Hill AFB are projecting 25,458 flying hours which will generate corresponding engine overhaul requirements.

(U) FY 1994 Planned Program:

- (U) PDM will be accomplished on one B-1B, two F-15Bs, and one F-15D.
- (U) Annual ACEs will be done on three HH-1Hs and three UN-1Ns.
- (U) On Condition Maintenance will be done on two UH-1Ns.
- (U) Seventeen Special Purpose Vehicles (ten compressed gas trailers, three MB-4s, and four R-9s) will be overhauled.
- (U) Cockpit enclosure/rewiring for T-38s is expected to cost \$1.3M.
- (U) Three F-16 F100-220E engines will be input for modification/update.
- (U) F-16s miscellaneous work is expected to cost \$1.0M.
- (U) Additional paint requirements for seven aircraft is expected to cost \$231K.
- (U) Edwards AFB and Hill AFB are projecting 23,790 flying hours which will generate corresponding engine overhaul requirements.

- (U) Work Performed By: Depot level maintenance is performed either organically by the Air Force Materiel Command (AFMC) Air Logistic Centers (ALCs) or contractually with the ALCs negotiation/administering the contract. Organically, work is performed at all five AFMC ALCs. Contractually, work is performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; PEMCO, Birmingham, AL; and Vought Corp., Dallas, TX.

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Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide
Mission Support

(U) Related Activities:

- (U) PE 0605807F, Test and Evaluation Support, (Test Aircraft Operation).
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 2114, 4950th Test Wing*: The 4950th Test Wing, Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH, performs flight tests of aircraft and airborne systems, and supports space vehicle tracking for DOD and the National Aeronautics and Space Administration. The 4950th Test Wing currently has the following types and quantities of test/test support aircraft assigned: C-18B(1); EC-18B(4); EC-18D(2); C-135A(1); C-135E(2); EC-135E(4); NKC-135A(3); NKC-135E(2); NC-141A(4); T-39A(2); and T-39B(5). Total aircraft assigned: 30. Additionally, ASC is responsible for aircraft leased to contractors, loaned to other Government agencies, or furnished to contractors under Government Furnished Property (GFP) clauses. The Air Force programs and pays for support of these aircraft through the 4950th Test Wing account. Based on current and projected FY93/94 contracts and agreements, AFMC is responsible for costs associated with one NC-131H, one NT-33A, and the VISTA F-16. Costs for these three aircraft are included in the 4950th Test Wing project.

*Note: Consistent with the consolidation of the 4950th Test Wing with AFFTC at Edwards AFB, the first increment of aircraft (the T-39s and C-141s) will move to AFFTC by May 93. The second increment of aircraft are scheduled to move between Dec 93 and Apr 94. Once the move is complete and the 4950th TW mission is transferred, Project 2114 will close out and funding will roll into project 2112.

(U) FY 1992 Accomplishments:

- (U) PDM was accomplished on two C-18s, three C-135s, and one NC-141A.
- (U) Special inspections were done on the NC-131H and the NT-33A.
- (U) Cost for C-18 component overhauls and sustaining engineering was \$4.5M.
- (U) Modification/update was accomplished on one T-39.
- (U) The 4950th Test Wing flew 7,686 hours which generated corresponding engine overhaul requirements.

(U) FY 1993 Planned Program:

- (U) PDM will be accomplished on one C-18, one NC-141A, and two C-135s.
- (U) Special inspections will be accomplished on the NC-131H and the NT-33A.
- (U) C-18 component overhauls and sustaining engineering are projected to cost \$2.7M.
- (U) C-18 Tech Order re-write/update.
- (U) The 4950th Test Wing is projecting 7,446 flying hours which will generate corresponding engine overhaul requirements.

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Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide
Mission Support

(U) FY 1994 Planned Program:

- (U) PDM will be accomplished on one EC-18, one EC-135, and one C-141.
- (U) Special inspections will be done on the C-131H and the NT-33A.
- (U) C-18 component overhauls and sustaining engineering are projected to cost \$2.7M.
- (U) The 4950th Test Wing is projecting 7,480 flying hours which will generate corresponding engine overhaul requirements.

(U) Work Performed by: Depot level maintenance is performed either organically by the Air Force Materiel Command (AFMC) Air Logistic Centers (ALCs) or contractually with the ALCs negotiating/ administering the contract. Organically, work is performed at the five AFMC ALCs. Contractually, work is performed by E-Systems, Inc., Greenville, TX; Boeing Military Airplane Company, Seattle, WA; Lockheed, Marietta, GA; and the Vought Corp., Dallas TX.

(U) Related Activities:

- (U) PE 0605807F, Test and Evaluation Support. (Test aircraft operations).
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605876F
PE Title: Minor Construction
(RPM) - RDT&E

Budget Activity: #6-Defense-Wide
Mission Support

A. (U) RESOURCES (\$ In Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
6606MC, Minor Construction	*0	2,899	7,739	Cont	TBD

*FY92 and prior, funded in PE0605894F

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential Minor Construction (MC) at three Air Force Materiel Command Major Range and Test Facility Bases (MRTFBs): Eglin AFB, FL, Edwards AFB CA, and Arnold AFB, TN. Physical plant maintained by this account covers 800,000 acres of land; over four thousand structures in excess of 30 years old encompassing fifteen million square feet; over five million square yards of airfield pavement; 1900 miles of road network (six times the road network of the District of Columbia); utility systems that include 120 wells, 10 sewage treatment plants, 20 substations and over 1600 miles of high voltage electrical distribution lines.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:

- (U) 6606MC, Minor Construction (MC): Project adapts facilities to current mission needs and standards (in-house and by contract) through additions, alterations, replacements, relocations, new facilities, and related administration. Physical plant of the three MRTFBs has a replacement value in excess of \$7 billion. A minimum of \$15M is required to cover minimum requirements. Minimum investment level in the physical plant is essential to assure continued mission support. Air Force Materiel Command has targeted 1.5% of plant replacement value, even though private industry targets about 3-5%.
- (U) FY 1992 Accomplishments:
 - (U) Not applicable.
- (U) FY 1993 Planned Program:
 - (U) \$2.7M of the FY93 program is for the in-house minor construction work force (payroll, supplies, materials and equipment to finance in-house work).
 - (U) \$0.2M is for MC by contract. MC requirements include work required for addition, alteration, expansion or extension to a facility; and procurement and installation of Real Property Installed Equipment.
- (U) FY 1994 Planned Program:
 - (U) \$2.8M of the FY94 program is for the in-house minor construction work force (payroll, supplies, materials and equipment to finance in-house work).
 - (U) \$4.9M is for accomplishment of MC by contract. The increased funding is a partial recovery from previous underfunding. Funding will support fire protection system upgrades; utility system improvements; engine test maintenance facility expansion; and interior building upgrades.
- (U) Work Performed by: In-house work force; Conerly Construction, FL; Lord & Son Construction, FL; SSI, PA; Sverdrup Inc, MI; Cal Span Corp, OH; Steven's Construction, CA; Foote Corp, CA.

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Program Element: #0605876F
PE Title: Minor Construction
(RPM) - RDT&E

Budget Activity: #6-Defense-Wide
Mission Support

- (U) Related Activities:
 - --(U) PE0605807F, Test and Evaluation Support (TES), provides the mission funds for civilian personnel at Arnold AFB since mission support consumes almost all personnel efforts.
 - --(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605878F
PE Title: Maintenance and Repair
(RPM) - RDT&E

Budget Activity: #6-Defense-Wide
Mission Support

A. (U) RESOURCES (\$ In Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
6606MR, Maintenance and Repair of Real Property	*0	50,918	46,020	Cont	TBD

*FY92 and prior, funded in PE0605894F

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential Real Property Maintenance and Repair at three Air Force Materiel Command Major Range and Test Facility Bases (MRTFBs): Eglin AFB, FL; Edwards AFB, CA; and Arnold AFB, TN. Physical plant maintained by this account covers: 800,000 acres of land; over four thousand structures in excess of 30 years old; encompassing fifteen million square feet; over five million square yards of airfield pavement; 1900 miles of road network (six times the road network of the District of Columbia); utility systems that include 120 wells, 10 sewage treatment plants, 20 substations and over 1600 miles of high voltage electrical distribution lines.

C. (U) JUSTIFICATION FOR PROJECTS GREATER THAN \$10.0 MILLION IN FY 1994:

(U) 6606MR, Maintenance and Repair of Real Property:

Project funds the maintenance and repair (M&R) of basic infrastructure and complex test facilities to slow deterioration; ensure preservation of Air Force facility investment; and related administration. Physical plant of the three MRTFBs has a replacement value in excess of \$7 billion. A minimum of \$60M is required to cover minimum requirements. Minimum investment level in the physical plant is essential to assure continued mission support. Air Force Materiel Command has targeted 1.5% of plant replacement value, even though private industry targets about 3-5%.

— (U) FY 1992 Accomplishments:

— (U) Not applicable.

— (U) FY 1993 Planned Program:

- (U) \$32.2M of the FY93 program is for in-house maintenance and repair work force (payroll, supplies, materials and equipment to finance in-house work).
- (U) \$18.7M is for Maintenance and Repair (M&R) by contract for mission requirements to offset current deterioration of the physical plant. M&R requirements include: interior and exterior electrical; air conditioning, refrigeration and heating systems; pavements and grounds; structural includes protective coating, plumbing, and roofs; airfields and runways, and other health, and safety requirements.

— (U) FY 1994 Planned Program:

- (U) \$32.3M of the FY94 program is for in-house maintenance and repair work force (payroll, supplies, materials and equipment to finance in-house work).

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Program Element: #0605878F
PE Title: Maintenance and Repair
(RPM) - RDT&E

Budget Activity: #6-Defense-Wide
Mission Support

- (U) \$13.7M is for Maintenance and Repair (M&R) of Real Property by contract. Decreased funding in this fiscal year will cause deferral of facility projects and contribute to further deterioration of the physical plant. In cases where limited or decreased funding precludes use of contracts, emergency in-house M&R projects will only be accomplished when there is a major infrastructure failure. Accomplishing emergency M&R projects will result in more costly repairs later because of collateral damage done to facilities by the emergency situation; and could delay vital weapon system testing.
- (U) Work Performed By: In-house work force; Conerly Construction, FL; and Lord & son Construction, FL; SSI, PA; Sverdrup Inc, MI; Cal Span Corp, OH; Stevens Construction, CA; Foote Corp, CA.
- (U) Related Activities:
 - (U) PE0605807F, Test and Evaluation Support (TES), provides the mission funds for civilian personnel at Arnold AFB since mission support consumes almost all personnel efforts.
 - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605896F

Budget Activity: #6 - Defense-Wide

PE Title: Base Operations Support RDT&E

Mission Support

A. (U) RESOURCES (\$ in Thousands):

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
6606BS Base Operating Support	75,808	66,519	75,278	Cont	TBD
6606CE Other Support	0	22,865	26,946	Cont	TBD
6606UT Operations of Utilities	<u>0</u>	<u>14,550</u>	<u>19,750</u>	<u>Cont</u>	<u>TBD</u>
Total	75,808	103,934	121,974	Cont	TBD

NOTE: This program element is an Air Force RDT&E test infrastructure account which provides funding for Base Operating Support (BOS) to the Air Force Major Range and Test Facility Bases (MRTFB) at Edwards AFB CA, Eglin AFB FL, and Arnold AFB TN. The FY 1993 and 1994 budget increase for this account reflects the zero balance transfer of civil engineering and utilities programs from PE 0605894F, Real Property Maintenance Activity (RPMA).

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides basic, essential services of base operating support at three Air Force Materiel Command (AFMC) bases: Eglin AFB FL, Edwards AFB CA, and Arnold AFB TN. These three Air Force bases form the core of the Air Force Test and Evaluation infrastructure to support the DOD test mission. These bases are unique national assets specifically established for T&E and are funded by RDT&E appropriations. The program funds bare minimum "open-the-doors" costs of day-to-day support for the Air Force portion of the DOD Major Range and Test Facility Base (MRTFB). These three locations have over 90 tenant organizations and an aggregate population in excess of 55,000 people. Civilian pay represents approximately 47 percent of the total program, with the remainder of the program financing administrative support, security and guard services, dormitories, billeting, food services, training, utility operations, civil engineering services, transportation, and motor pools. Functions supported by this program element include comptroller, chaplain, personnel, supply, transportation and information management.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 6606BS, Base Operating Support: Funds bare essential base operating support which includes civilian pay, security and guard services, dormitories, billeting, food services, training, transportation and motor pools, comptroller, chaplain, supply, information management and quality of life services for the respective bases.

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Program Element: #0605896F

PE Title: Base Operations Support RDT&E

Budget Activity: #6 - Defense-Wide

Mission Support

(U) FY 1992 Accomplishments:

- (U) Restored base operating support to three AFMC bases only to the FY 1990 level, maintaining only minimum levels of base support (\$1.3M civilian pay raise, \$1.4M inflation, and \$6.3M correction of FY 91 programming error).
- (U) Supported the management realignment of Air Force Development Test Center from a Product Division host (the former Munitions Systems Division was O&M funded) to an RDT&E test center host (\$4M civilian pay for 114 positions and \$1.2M support costs) and military-to-civilian conversions of 22 manpower positions.
- (U) Funded 1,040 civilian workyears with a payroll in excess of \$36M.

(U) FY 1993 Planned Program:

- (U) Continues minimum base operating support for the three AFMC bases.
- (U) Funds Civilian pay increase (\$1.8M).
- (U) Funds inflation increase (\$1.8M).
- (U) Funds 1,037 civilian workyears with a payroll in excess of \$37M.
- (U) Program Content Changes:
 - (U) Includes funding for military-to-civilian conversion of an additional 40 manpower positions (\$1.1M civilian pay) and increased operational cost for the institution of the Defense Business Operating Fund (\$1.4M).
 - (U) Defers mission essential training by 25 percent.
 - (U) Reduces level of transportation support by 33 percent.
 - (U) Postpones the repair/replacement of communication equipment.
 - (U) Delays accomplishment of all non-emergency work orders.

(U) FY 1994 Planned Program:

- (U) Provides base operating support for three AFMC bases to minimum levels necessary for the bases to perform testing required.
- (U) Cost estimate based on firm contractor prices, known civil service pay scales and adjustments for inflation.
- (U) Program content changes:
 - (U) Provides basic level of funding to accomplish mission essential training.
 - (U) Provides Quality of Life changes for military personnel at the Air Force Flight Test Center.
 - (U) Reduce backlog of maintenance and repair of deteriorating communication systems.
 - (U) Reduce backlog of non-emergency work orders.

- (U) Work Performed By: AFFTC, AEDC, and AFDTC in-house work force and various service contractors. Major service contractors include General Services Administration; Kass Management Services Inc., Oakland CA; Management Tech

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Program Element: #0605896F

Budget Activity: #6 - Defense-Wide

PE Title: Base Operations Support RDT&E

Mission Support

Services, CA; Computer Sciences Corporation, CA; Madison Services, MI; General Physics Corp., MD and SSI Services, Inc. Contracts are firm-fixed price plus award fee.

(U) Related Activities: PE 0605807F, Test and Evaluation Support, provides test mission operating funds for Air Force Flight Test Center at Edwards AFB, Air Force Development Center at Eglin AFB, and Arnold Engineering Development Center at Arnold AFB. There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 6606CE, Other Support: Provides resources for fundamental civil engineering services such as custodial, fire protection, hazardous material systems certification, refuse collection, insect/pest control, rentals/leases, Architectural and Engineering (A&E) Design, grounds maintenance as well as CE administrative costs including equipment, supplies, TDY, and civilian pay.

(U) FY 1992 Accomplishments:

- (U) Project was funded under PE 0605894F, RPMA.

(U) FY 1993 Planned Program:

- (U) Provides funding for fundamental civil engineering services and ongoing essential services necessary to sustain direct mission support facilities such as runways and taxiways, and test facilities; as well as quality of life related facilities such as dining halls, dormitories, and recreational facilities. Majority of funding is "must pay" requirements to protect health and welfare of bases' populace. Current year program funds:
 - (U) Civilian pay (\$9.5M).
 - (U) Custodial services (\$4.2M).
 - (U) Other services (\$3.0M).
 - (U) Equipment (\$0.7M).
 - (U) Supplies (\$5.5M).

(U) FY 1994 Planned Program:

- (U) Continues minimum support services.
- (U) Cost estimate based on firm contractor prices, known civil service pay scales and adjustments for inflation.
- (U) Provides funding for fundamental civil engineering services and ongoing essential services necessary to sustain direct mission support facilities such as

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Program Element: #0605896F
PE Title: Base Operations Support RDT&E

Budget Activity: #6 - Defense-Wide
Mission Support

runways and taxiways, and test facilities; as well as quality of life related facilities such as dining halls, dormitories, and recreational facilities. Majority of funding is "must pay" requirements to protect health and welfare of bases' populace. Program funds:

- (U) Civilian pay (\$9.5M).
- (U) Custodial services (\$4.2M).
- (U) Other services (\$3.1M).
- (U) Equipment (\$3.4M).
- (U) Supplies (\$6.8M).

(U) Work Performed By: AFFTC, AEDC, and AFDTC in-house work force and various service contractors. Major service contractors include General Services Administration; Litton Food Management Service, Wayne PA; Delta Patrol Services, Long Beach CA; Cal Disposal, CA; Madison Services, MI; Management Technical Services, CA; and Environmental Waste, FL; SSI Services Inc., TN; Sverdrup Technology Inc, MO; Calspan Corp, OH; and General Physics, MD. The majority of these contracts are cost plus award fee.

(U) Related Activities: PE 0605807F, Test and Evaluation Support, provides test mission operating funds for Air Force Flight Test Center at Edwards AFB, Air Force Development Center at Eglin AFB, and Arnold Engineering Development Center at Arnold AFB. There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 6606UT, Operations of Utilities: Funds crucial purchase of utilities (electricity, natural gas, water and sewage treatment), base operation of water and sewage treatment plants and distribution systems (which are "must-pay" bills for Edwards and Eglin AFBs) and related administration. Amounts of utilities consumed and wastes processed for discharge exceed those of a normally operating base due to the testing mission.

(U) FY 1992 Accomplishments:

- (U) Project was funded under PE 0605894F, RPMA.

(U) FY 1993 Planned Program:

- (U) Purchase of utilities and operation of utility plants and distribution systems, which are "must pay" bills, with funds transferred from PE 0605894F, RPMA.

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Program Element: #0605896F

Budget Activity: #6 - Defense-Wide

PE Title: Base Operations Support RDT&E

Mission Support

- (U) Utility bill requirement (\$13.5M).
- (U) Personnel, Equipment, Supplies, and related admin (\$1.0M).

(U) FY 1994 Planned Program:

- (U) Continues purchase of utilities and operation of utility plants and distribution systems, which are "must pay" bills, with funds transferred from PE 0605894F, RPMA.
- (U) Utility bill requirement (\$15.3M).
- (U) Personnel, Equipment, Supplies, and related admin (\$4.4M).

(U) Work Performed By: AFFTC, AEDC, and AFDTC in-house work force and various service contractors. Major service contractors include General Services Administration; Southern California Edison (SCE), CA; Pacific Gas and Electric Company, CA; Florida Power & Light, FL; and Gulf Power, FL; and Cal Disposal, CA; and Western Area Power Administration (WAPA).

(U) Related Activities: PE 0605807F, Test and Evaluation Support, provides test mission operating funds for Air Force Flight Test Center at Edwards AFB, Air Force Development Center at Eglin AFB, and Arnold Engineering Development Center at Arnold AFB. There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0702207F
 PE Title: Depot Maintenance

Budget Activity: #6 Defense Wide Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Project</u> <u>Number &</u> <u>Title</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
3326, Precision Measurement & Calibration Equipment Development (PMCED)	2928	2729	1830	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops, tests and evaluates measurement standards and associated equipment for 186 base precision measurement equipment laboratories (PMEL) worldwide. The technology of modern weapons systems requires continuing research and development of calibration equipment to support the Air Force mission.

C. (U) JUSTIFICATION FOR SINGLE PROJECT LESS THAN \$10.0 M IN FY 19941. (U) 3326, PMCED:

Designed to develop, test, and evaluate standards and associated equipment used in the measurement and calibration of advanced weapons systems and support equipment. Includes such high technology as lasers, microwave, millimeter wave, electro-optical, and automated test equipment. Work supports the overall advancement of National technology.

(U) FY 1992 Accomplishments

- (U) Completed characterization of new Air Force attenuation standard for improved support of radio frequency (RF) communications and radar systems.
- (U) Completed technique to measure 100m optical fiber path length to 1mm for fault detection in avionic and communications systems.
- (U) Completed development of new detector standard for infrared (IR) spectral response for target designators.
- (U) Continued development of electro-optical standards in the ultraviolet (UV), visible and IR spectrums to support missile detection requirements.
- (U) Continued improvements in antenna calibration to support satellite communications.
- (U) Initiated work on microwave material reflectivity measurements to improve measurements of low observables.
- (U) Initiated work on calculating diffraction losses for missile tracking.

(U) FY 1993 Planned Program:

- (U) Complete method of calculating diffraction losses for missile tracking.
- (U) Continue work in the radar low observables area.
- (U) Continue work on millimeter wave capabilities to support imaging radar systems.
- (U) Continue to expand development of electro-optical standards.
- (U) Initiate work with the Phillips laboratory to improve traceability for their Long Wavelength Infrared (LWIR) to UV observatories measurements.
- (U) Begin testing of verification techniques for coordinate measuring machines used widely in AF depots.

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Program Element: #0702207F
PE Title: Depot Maintenance

Budget Activity: #6 Defense Wide Mission Support

(U) FY 1994 Planned Program:

- (U) Complete development of IR reflectance standards for low observables.
- (U) Continue microwave material reflectivity measurement improvements to support low observable technologies.
- (U) Continue improvements in traceability of observatory activities.
- (U) Develop techniques for calibration of dynamic torque devices for airframe and engine fasteners.
- (U) Complete verification techniques for coordinate measurement machines for depot acceptance of engine and air frame components.
- (U) Complete development of IR standards for low observables.

(U) WORK PERFORMED BY: Most of the work is performed by the National Institute of Standards and Technology (NIST). The remainder being performed by private industry, universities/non-profit institutions, and the Air Force Directorate of Metrology. Activity is directed by the Joint Logistics Commanders Technical Coordinating Group for Metrology and Calibration.

(U) Related Activities:

- (U) National Institute of Standards and Technology (NIST) uses some in-house funds to advance these areas.
- (U) Projects are coordinated with the Army and Navy Metrology R&D Programs who fund other developments.
- (U) Results of these projects contribute to the technological advancement of industry through regular calibration services.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriated Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708012F
 PE Title: Logistic Support Activities

Budget Activity: #6-Defense-Wide
Mission Support

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
3090 Embedded Computer Resources Support Improvement Program (ESIP)	4,943	4,604	5,035	Cont	TBD
3317 Air Force Digital Specifications and Standards	<u>1,600</u>	<u>1,207</u>	<u>1,301</u>	<u>Cont</u>	<u>TBD</u>
Total	6,543	5,811	6,336	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the growing need for research and development of support issues related to the increasing reliance on computer resources. New software design techniques, software support tools, environments, and processes; and standards for digital documentation will result from this program. Functions formerly accomplished in hardware have been assumed by software, and software which can be changed to meet new and different threats and missions is critical to the ability of the Air Force to be responsive to world situations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10 MILLION IN FY 1994:

1. (U) Project Number, Project Title: 3090, ESIP. This project conducts research to improve support of embedded computer system software. It encompasses automation and standardization of support processes, advanced support methodologies, tools and environments, and readiness support to facilitate rapid turnaround of software in response to changing mission and/or changing threat requirements.

(U) FY 1992 Accomplishments:

- (U) Conducted design reviews on automated test generation effort
- (U) Pursued application of automated validation of software tests on F-15E and Joint Surveillance Target Attack Radar System (JSTARS)
- (U) Initiated data visualization techniques for problem analysis
- (U) Initiated smart controller for anomaly identification
- (U) Applied radio frequency (RF) simulation data streaming techniques for electronic warfare (EW) support
- (U) Initiated modular embedded computer software techniques of partitioning and optimization scheduling
- (U) Defined emulators/stimulators required for advanced support environment (ASE)

(U) FY 1993 Planned Program:

- (U) Demonstrate hypermedia technology to automate software documentation and use on E-3A maintenance manuals
- (U) Integrate Ada tools into advanced support environment (ASE)
- (U) Demonstrate automatic test generation techniques in the ASE
- (U) Assess prototype virtual simulator for specific applications
- (U) Pursue hardware stimulators/emulators for test environment

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Program Element: #0708012F
PE Title: Logistic Support Activities

Budget Activity: #6-Defense-Wide
Mission Support

- (U) Assess data requirements for smart software instrumentation to
 - (U) Collect anomaly data to reduce software correction time
 - (U) Demonstrate fault tolerant techniques to improve weapon delivery under corrupted data situations
 - (U) Identify initial FORTRAN to Ada reengineering requirements
 - (U) Explore object oriented technology to address support issues
 - (U) Identify parallel processing support issues
- (U) FY 1994 Planned Program:
- (U) Initiate advanced avionics instrumentation and sensor control capability for capturing software anomalies in flight
 - (U) Test data instrumentation collection prototype on F-15 test aircraft
 - (U) Demonstrate avionics data visualization concepts to improve data analysis and reduction to identify and correct anomalies
 - (U) Continue development of prototype virtual simulator
 - (U) End preliminary work to use hypermedia on technical manuals
 - (U) Demonstrate automated verification and validation test case generation and begin evaluation within an ASE

(U) Work Performed By: In-house work is done by Wright Laboratory, Wright-Patterson AFB, OH. The top five contractors are Science Applications International Corporation (SAIC), Panama City, FL; The Analytical Science Corporation (TASC), Reading, MA; Hughes, El Segundo, CA; TRW, Dayton, OH; and Westinghouse, Baltimore, MD.

(U) Related Activities: None. There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable

2. (U) Project Number, Project Title: 3317, Air Force Digital Specifications and Standards. This project conducts research leading to the development and updating of digital standards. These standards are required to implement the computer-aided acquisition and logistics support (CALS) concept.

- (U) FY 1992 Accomplishments:
- (U) Developed operating CALS standard generalized markup language (SGML) library (CSL) prototype
 - (U) Developed MIL-M-28001B, MIL-R-28002B, MIL-D-28003A, and MIL-M-28000A
 - (U) Developed concept of operations for CSL and tagset registry, and drafted CALS standards management plan

- (U) FY 1993 Planned Program:
- (U) Establish initial capability for CALS SGML library and database and operational capability for SGML baseline tagset library
 - (U) Coordinate and publish MIL-STD-1840B, MIL-M-28001B, MIL-R-28002B, and MIL-D-28003A
 - (U) Develop and publish MIL-HDBK-59B, MIL-M-28000B, and SGML handbook
 - (U) Finalize and publish CALS standards management plan

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Program Element: #0708012F
PE Title: Logistic Support Activities

Budget Activity: #6-Defense-Wide
Mission Support

- (U) Continue development of standards for hypertext, document style, semantics, and specification language, contractor integrated technical integration services (CITIS), and product description exchange using standard for exchange of product data (PDES/STEP)

(U) FY 1994 Planned Program:

- (U) Develop and publish MIL-STD-1840C, MIL-R-28002C, MIL-D-28003B, and MIL-M-28001C

- (U) Establish full capability for CALS SGML library and database

- (U) Manage SGML library and tagset registry

- (U) Develop CITIS specifications and standards

- (U) Continue development of standards for hypertext, document style, semantics, and specification language, CITIS, and PDES

(U) Work Performed By: In-house work is done by the CALS Digital Standards Office, Air Force Materiel Command, Wright-Patterson AFB, OH. The contractor is Maxima Corp., Beavercreek OH.

(U) Related Activities: None. There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands): Not Applicable.

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FY 1994 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708026F

PE Title: Productivity, Reliability, Availability, Maintainability (PRAM)

Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES (\$ in Thousands)

Project Title	FY 1992	FY 1993	FY 1994	To	Total
<u>Popular Name</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
Productivity, Reliability, Availability, Maintainability (PRAM)	23,677	22,307	18,068	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: PRAM was formed in 1975 by the AF Chief of Staff to: reduce current and potential operations and support costs; to improve the effectiveness of Air Force operational systems, subsystems, and equipment by providing "front end" investments for the adaptation and prototyping of off-the-shelf technology; and to promote the tenets of the USAF R&M 2000 process. PRAM, a level-of-effort program, has 123 active projects with a targeted return-on-investment of 15 to 1. The efforts listed below represent only a sampling of projects being pursued and are not intended to be a complete listing of all ongoing efforts.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Accomplishments:

- (U) Sixport Waveguide Switch. It was the highest failure item on the E-3A during Desert Storm. Reliability will increase an estimated 14 times with repair times reduced 10-fold.
- (U) Solid State Barometric Altimeter. Current altimeters require "watchmaker" skills to repair due to their complex internal design. The new altimeter will be 20 times more reliable and require much less time and skill to repair due to its solid state design.
- (U) Solid State Air Navigation Multiple Indicator (ANMI). This state-of-the-art Liquid Crystal Display will have 6 times the reliability than the system being replaced and be easier to maintain.
- (U) Completed the redesign and test of a new shipping and storage container for the ALQ-155 Receiver/Transmitter (RT). The current wooden container requires extensive preparation, is limited to 10-shipments, and cannot be shipped by LOGAIR if the RT unit is leaking. The new aluminum container has a 20-year life and removes all previous shipment restrictions. Lessons learned from this effort will be applicable to other containers suffering from the same deficiencies.

2. (U) FY 1993 Planned Program:

- (U) Continue FY 92 actions to qualify a new corrosion resistant, high temperature alloy. The alloy will be initially implemented on the F-15 C/D aircraft main wheel. The current main wheel requires frequent depot maintenance and is subject to corrosion. The new wheel will have 9 times the corrosion resistance and be twice as reliable as the current wheel. This wheel material also is also applicable to the F-15A/B, ATF, and other future aircraft.
- (U) Testing of a "Life of the Aircraft" brake housing will be completed and initially implemented on the F-15. The project will test an aluminum-iron-vanadium-silicon alloy brake housing that is stiffer, has greater high temperature strength than the current 7049 alloy, will never require heat treating, and is expected to last the life of the aircraft.

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Program Element: #0708026F

PE Title: Productivity, Reliability, Availability,
Maintainability (PRAM)

Budget Activity: #6-Defense Wide Mission Support

- (U) Develop a repair procedure for the graphite polyimide external augmentor flap on the F-100-PW-220 and -229 engines. This composite repair technology advance will greatly enhance the USAF defect analysis and engine repair capability. The upgrade will vastly enhance R&M and reduce ownership costs.

3. (U) FY 1994 Planned Program:

- (U) Complete work on a Neural Radiant Energy Detection System (NREDS). This system will use artificially intelligent neural network technology to identify malfunctioning components of circuit cards. An expected 30% reduction in total repair cost, provided by NREDS, could yield a potential cost savings of as much as \$100 million per year for the F-16 alone.
- (U) Begin prototyping, test, and qualification of a War Reserve Material (WRM) external fuel tank for USAF aircraft. The current peacetime welded tank requires 30 manhours to assemble while the tank developed by this project will require no more than 3 hours.
- (U) Begin development of a repair procedure for the engine sprayed abradable compressor tip shrouds on new generation engines. This procedure will reduce maintenance flow time and increase combat capability.
- (U) Complete implementation of modular fixturing technology. Modular fixturing allows fixtures to be built for specific machine tool applications using a "building block" approach. These fixtures can then be used to produce dedicated prototype fixtures for low volume, high mix production runs. This capability significantly enhances the ability to resolve aircraft, engine, and accessory downtime, thereby improving combat readiness. Modular fixturing is expected to not only decrease the lead time required to build a dedicated fixture, but to also eliminate manhours and downtime with an estimated savings to the government of \$4.7 million.

4. (U) Program to Completion:

- (U) This is a continuing program.

D. (U) Work Performed By: The PRAM Program Office is a division of the Technology Transition Office located at Wright-Patterson AFB, OH. Other organizations involved are HQ USAF, HQ AFMC, produce centers, air logistics centers and laboratories. The five largest participating contractors are McDonnell-Douglas, St. Louis, MO; Garret Fluid Systems Division, Tempe, AZ; Northrop Corp., Rolling Meadows, IL; AAI Corp., Hunt Valley, MD; and Bendix Wheels/Brakes, South Bend, IN. There are 63 other contractors.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Not applicable.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

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Program Element: #0708J26F

PE Title: Productivity, Reliability, Availability,
Maintainability (PRAM)

Budget Activity: #6-Defense Wide Mission Support

G. (U) RELATED ACTIVITIES:

- (U) PRAM works in a complimentary role with the Reliability and Maintainability Technology Insertion Program (RAMTIP), PE 0604609F; the Fastener, Actuator, Connector, Tool, and Subsystems program (FACTS), PE 0708004F, and the Aircraft Engine Component Improvement Program (CIP), PE 0604268F as it relates to reliability and maintainability improvements in operational engines.
- (U) All PRAM projects are closely coordinated with the AF laboratories to preclude duplication of effort and to take advantage of technology advances emanating from the laboratory environment.
- (U) All PRAM projects are reviewed for potential Army/Navy interest, and dialogue is established in cases where commonality of problems exist such that solutions become DoD-wide.
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708054F
 PE Title: Pollution Prevention

Budget Activity: 6 - Defensewide
Mission Support

A. (U) RESOURCES BY PROJECT (\$ in Thousands):

<u>Project Title</u> <u>Popular Name</u>	<u>FY 1992</u> <u>Actual</u>	<u>FY 1993</u> <u>Estimate</u>	<u>FY 1994</u> <u>Estimate</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Pollution Prevention	0	0	26,477	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

This program funds all costs associated with pollution prevention including the qualification of environmentally acceptable materials and processes to replace existing hazardous materials and processes in weapon systems, support systems, and facilities. Also funds all pollution prevention efforts required to accomplish the objectives and subobjectives of the Air Force Pollution Prevention Action Plan which includes eliminating the use of ozone depleting chemicals; reducing the generation of solid waste, hazardous waste, air emissions and wastewater; and establishing recycling programs at the Research and Development Activities Installations (Eglin, Arnold and Edwards AFBs). If not supported, the Air Force will not be in compliance with our treaty obligations in the Montreal Protocol and will continue to be responsible for escalating waste disposal quantities and costs and increased legal liabilities.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:1. (U) FY 1992 Accomplishments

- (U) None, program is a new start in FY 94.

2. (U) FY 1993 Planned Program

- (U) None, program is a new start in FY 94.

3. (U) FY 1994 Planned Program

- (U) First year of new start program.
- (U) Funding of Eglin, Arnold and Edwards AFBs pollution prevention O&M requirements to include solid waste recycling, hazardous waste minimization and hazardous material management.
- (U) Qualification of commercially available material, equipment and processes to support the Action Plan objectives.

4. (U) Program to Completion:

- (U) This is a continuing program.

D. (U) WORK PERFORMED BY: Contract use is at the discretion of the executing Commands. The primary Command for this requirement will be the Air Force Material Command.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: This is a new start in FY 94.

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Program Element: #0708054F
 PE Title: Pollution Prevention

Budget Activity: 6 - Defensewide
Mission Support

F. (U) PROGRAM DOCUMENTATION:

- AF Pollution Prevention Action Plan, dated 7 Jan 93.
- AF Ban on Purchases of Ozone Depleting Chemicals, dated 7 Jan 93

G. (U) RELATED ACTIVITIES:

- (U) Program Element 0604708F, Civil Engineering/Aircraft Support Equipment
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (\$ In Thousands):

- (U) Other Procurement (Other Base Maintenance and Support Equip)

FY 1992	FY 1993	FY 1994	To	Total
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
0	0	440	500	940

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

The Montreal Protocol on Substances that Deplete the Ozone Layer was ratified by the Senate in 1988 and entered into force on 1 January 1989. The agreement eliminates the production and consumption of substances that deplete the ozone layer by the end of 1995. This PE provides the funding for this phaseout requirement.

J. (U) MILESTONE SCHEDULE:

1. Institutionalize PP in Systems Acquisition December 1994
2. Institutionalize PP in Hazardous Materials December 1994
 Minimization and Management in Maintenance
 and Modification Processes
3. Eliminate the purchase of all ODC solvents, and equipment/systems/products requiring ODCs December 1994
4. Review 25% of TOs, MILSPECS and MILSTDS December 1995

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0804734F Budget Activity: #6 Defense-
PE Title: CRYPTO/SIGINT Related wide Mission Support
Skill Training

A. (U) Resources (\$ in Thousands)

<u>Project</u>	<u>Number &</u>	<u>FY 1992</u>	<u>FY 1993</u>	<u>FY 1994</u>	<u>To</u>	<u>Total</u>
<u>Title</u>	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>	
1005 SENTINEL BRIGHT Phase II	0	0	1.926*	4.900	8.500	

* Not a new start -- FY93 & prior funded in Other Procurement APPN.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The initial submission of this Descriptive Summary, reflected the zero-base transfer of APPN 3080 funding to APPN 3600 funding to support completion of the SENTINEL BRIGHT Phase II (SB II) software development, since all hardware was procured prior to FY93. SENTINEL BRIGHT supports system definition, development, and acquisition of computer aided/computer managed instruction (CAI/CMI) to modernize training for Air Force and DoD intelligence specialists. SB II specifically supports training of cryptologic analysts and maintenance personnel. (SENTINEL BRIGHT Phase I has been supporting training of cryptologic linguists on-line since July 1986.) The overall SENTINEL BRIGHT program will substantially contribute to the preparation of intelligence technicians to meet requirements of the next century. The program will parallel the fielding of modernized operational intelligence systems and correct long-standing deficiencies in training capabilities of the intelligence community.

Background: American Systems Corp. (ASC), the initial SB II prime contractor, experienced financial difficulties beginning in 1990 severely threatening the completion of SB II. Conditions worsened in May 1991, when ASC's bank demanded it decrease its debt level. A Program Office audit revealed ASC was on the verge of bankruptcy and suggested a buy-out be initiated. As a result of the buy-out (completed in Jul 91), the government received 310 complete workstations, 60% finished software (delivered "as is" without documentation), design rights, and critical subcontractor proprietary agreements. Additionally, the contractor dropped all claims against the government. Because of this unique problem, it was essential a new SB II contract be let to complete the software design and coding. SENTINEL BRIGHT guidance documents are ATC SON 05-78 (Revised) and AF PMD 0110, as amended.

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Program Element: #0804734F
PE Title: CRYPTO/SIGINT Related
Skill Training

Budget Activity: #6 Defense-
wide Mission Support

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10 MILLION IN FY 1994:

1. (U) 1005, SENTINEL BRIGHT Phase II:

(U) FY92 Accomplishments: Not Applicable.

(U) FY93 Planned Program: Not Applicable.

(U) FY94 Planned Program:

- (U) Continue development of Block 1 and 2 software.
- (U) Task contractor to initiate development of software for Block 3 - System and Training Administration.

(U) Work Performed By:

(U) The prime Contractor is Engineering Research Associates of Vienna, VA. HQ Electronic Systems Center is the System Program Office (SPO) and is supported by MITRE Corp as the IV&V contractor.

(U) Related Activities:

(U) The National Security Agency provides funding in Program Element 35885G, Tactical Crypto Program, to the Air Force which is the Executive Agent for training Cryptologic Intelligence personnel.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (\$ in Thousands)

(U) (BA 3, 832062)

FY 1992	FY 1993	FY 1994	To	Total
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	<u>Program</u>
6.171	3.800	0*	0	9.971

(* The 3080 funding converted to 3600 RDT&E and 3400 O&M in FY94. The 3600 funding will support completion of software development and 3400 funding will provide contractor logistic support for system hardware.)

(U) International Cooperative Agreements: Not applicable

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0901218F Budget Activity: #6 - Defense-wide
 PE Title: Civilian Compensation Program Mission Support

A. (U) RESOURCES (\$ In Thousands):

<u>Project Number & Title</u>	<u>FY92 ACTUAL</u>	<u>FY93 ACTUAL</u>	<u>FY94 ESTIMATE</u>	<u>TO COMPLETE</u>	<u>TOTAL PROGRAM</u>
4139 Civilian Compensation Program					
Total	5199	5135	5775	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT:

This program element provides funds for payment of civilian compensation benefits for disability due to personal injury sustained while in the performance of duty or due to employment related disease according to the Federal Employees' Compensation Act (FECA) under 5 U.S.C. Chapter 81. The Department of the Labor administers this program but charges the Department of the Air Force for its employee costs. This PE excludes manpower authorizations and costs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994:1. (U) 4139, Civilian Compensation Program:(U) FY 1992 Accomplishments:

Prior to FY 1990, this program was funded by O&M 3400 to pay disability compensation for all Air Force civilian employees in PE 0901218F regardless of which appropriation funded the civilian pay of personnel generating these costs. 1992 R&D funding paid for injuries and illnesses incurred by R&D employees.

(U) FY 1993 Planned Program:

To properly realign resources to capture true cost by appropriation, Air Staff directed that disability compensation be paid from the actual appropriation generating the costs. The amounts cited above funded only disability compensation of personnel assigned to RDT&E activities. This was not a new start but a realignment of charges to the proper appropriation rather than having O&M 3400 pay for all Air Force employees. Funds to cover this R&D program were transferred from O&M for FYs 90-94 since they were initially included in the O&M Future Year Defense Plan (FYDP).

(U) FY1994 Planned Program:

Continuing level of effort program to compensate employees assigned to RDT&E facilities for work related injury or disease. Increase costs due to medical inflation and 6.1% increase in compensation benefits based on the consumer price index (CPI).

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Program Element: #0901218 Budget Activity: #6 - Defense-wide
PE Title: Civilian Compensation Program Mission Support

- (U) Work Performed By: Private civilian health care providers including hospitals, physicians, and contractors providing nursing services, rehabilitation services, prosthetic appliances, and burial services. Bills for the Department of the Air Force for the total cost of benefits and other payments made on account of the injury or death of employees or individuals under the jurisdiction of their agency.
- (U) Other Appropriation Funds: Appropriation 3400 will provide disability compensation only for employees assigned to O&M activities.
- (U) International Cooperative Agreements: None

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0901600F
PE Title: DOD Financial Systems

Budget Activity: 6 - Defensewide
Mission Support

A. (U) RESOURCES (\$ In Thousands)

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	Fy 1994 Estimate	To Complete	Total Program
DOD Financial Systems	-0-	-0-	240,985	-0-	1,201,652

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND
SYSTEM CAPABILITIES:

The FY 94 budget reflects the portion of the Department's estimate for contract audit and management services that will be incurred as a result of contract awards made in this appropriation. These funds will be used to finance Defense Contract Audit Agency (DCAA) and Defense Contract Management Command (DCMC) services that are performed in support of programs budgeted in this appropriation.

This represents a change from the way the budget was presented last year and reflects a congressional and Departmental initiative to move toward mission budgeting which calls for an improved methods of budgeting and justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: Not Applicable.

D. (U) WORK PERFORMED BY: Defense Contract Audit Agency (DCAA) for contract audit functions and the Defense Contract Management Command (DCMC) for contract administration.

E. COMPARISON WITH FY 93 DESCRIPTIVE SUMMARY: Not applicable.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Not applicable.

H. (U) OTHER APPROPRIATION FUNDS: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not applicable.

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FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #1001004F
PE Title: International Activities

Budget Activity: #6 - Defense-Wide Mission Support
Date: February 19, 1993

A. (U) RESOURCES (\$ in Thousands)

<u>Project Number & Title</u>	<u>FY 1992 Actual</u>	<u>FY 1993 Estimate</u>	<u>FY 1994 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
6600AH SHAPE Technical Centre, von Karman Institute, AGARD, ICRD&A Support					
Total	3,023	3,522	3,820	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program satisfies Department of Defense (DoD) Executive Agent responsibilities for numerous projects, including US support for the North Atlantic Treaty Organization (NATO) Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC) in The Hague, Netherlands, the von Karman Institute (VKI) in Brussels, Belgium and the Advisory Group for Aerospace Research and Development (AGARD) in Paris, France, and supports AF commitments to all aspects of international cooperative research, development and acquisition (ICRD&A), including travel and participation in cooperative research and development agencies and groups. Support of this program is a continuing international commitment under the auspices of major alliance and mutual weapons development agreements.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN \$10.0 MILLION IN FY 1994

1. (U) Project #6600AH, Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC)/ von Karman Institute (VKI)/ Advisory Group for Aerospace Research and Development (AGARD)/ International Cooperative Research Development and Acquisition (ICRD&A) Support: STC- Supports USAF participation in cooperative research and development agencies and groups at STC. VKI- Fulfills US commitment (VKI Charter from 1956) to NATO for fair share cost allocation to VKI. AGARD- DoD Regulation 2010.1 designates AF as Executive Agent for managing and supporting AGARD activities. ICRD&A- Funds all aspects of seeking, negotiating, implementing and executing ICRD&A agreements.

(U) FY 1992 Accomplishments:

- (U) STC - Supported US interests through US R&D Coordinator who funds and monitors 15 scientists and engineers at STC.
- (U) VKI - Funded US share (12.8%) of the VKI international budget. Continued funding \$30K in USAF-VKI fellowships (open to all US citizens). VKI graduated over 70 scientists, conducted 10 lecture series and published numerous technical reports.
- (U) AGARD - Financially supported the participation of up to 100 US experts in 9 technical panels, 21 working groups and 1 study committee.
- (U) ICRD&A - Funded all aspects of Air Force international cooperative research, development and acquisition (ICRD&A) to include setting up conferences, travel and per diem to attend meetings; contractor support; and support for our European liaison offices. Negotiated and concluded agreements with major allies to assure AF access to overseas technology and to leverage AF R&D investments via cooperative programs. Supported major AF presence at Paris and Singapore Air Shows.

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Program Element: #1001004F
PE Title: International Activities

Budget Activity: #6 - Defense-Wide Mission Support

Continued support of OSD-led Systems and Technology Forum with Japan and increased cooperative efforts with NATO, Israel, Australia, Brazil and Sweden.

(U) FY 1993 Planned Program:

- (U) STC - Support US interests through US R&D Coordinator who funds and monitors 15 scientists and engineers at STC.
- (U) VKI - Fund US share (12.8%) of the VKI international budget. Restore funding for AF-VKI fellowships to FY-91 level and increase for greater participation and to account for increased costs.
- (U) AGARD - Increase financial support for the participation of US experts in 9 technical panels, 21 working groups and 1 study committee to FY-91 level. Initiate panels and working groups which interface with Eastern European and Former Soviet Union (FSU) technical and scientific groups.
- (U) ICRD&A - Restore funding to FY-91 level for all aspects of Air Force international cooperative research, development and acquisition (ICRD&A) to include setting up conferences, travel and per diem to attend meetings; contractor support; and support for our European liaison offices. Negotiate and conclude new agreements with major allies to assure AF access to overseas technology and to leverage AF R&D investments via cooperative programs. These include congressionally-mandated studies of cooperation with Israel. Major initiatives pursuing allied participation in military satellite communications and the US Joint Stars program are anticipated. Fund AF presence at major International Air Shows. Continue support of OSD-led Systems and Technology Forum with Japan. Initiate collaborative projects under 4-Power Air Senior National Representative Council and Israeli Reciprocal Defense Procurement Agreement. Initiate cooperative technical projects and engineer and scientist exchange programs with Eastern European and FSU countries.

(U) FY 1994 Planned Program:

- (U) STC - Support US interests through US R&D Coordinator who funds and monitors 15 scientists and engineers at STC.
- (U) VKI - Fund US share (12.8%) of the VKI international budget. Continue funding USAF-VKI fellowships.
- (U) AGARD - Financially support the participation of US experts in 9 technical panels, 21 working groups and 1 study committee. Increase participation in panels and working groups which interface with Eastern European and Former Soviet Union (FSU) technical and scientific groups.
- (U) ICRD&A - Fund all aspects of Air Force international cooperative research, development and acquisition (ICRD&A) to include setting up conferences, travel and per diem to attend meetings; contractor support; and support for our European liaison offices. Negotiate and conclude new agreements with major allies to assure AF access to overseas technology and to leverage AF R&D investments via cooperative programs. Support AF presence at major International Air Shows. Support OSD-led Systems and Technology Forum with Japan. Pursue collaborative projects, such as development of air to ground missiles, multi-role fighters, and environmental clean-up under 4-Power Air Senior National Representative Council. Initiate cooperative efforts exploiting foreign strengths in Defense Critical Technologies. Increase cooperative technical projects and engineer and scientist exchange programs with Eastern European and FSU countries. This is a continuing commitment in support of congressional guidance. The funding requirement is based on prior year amounts adjusted for inflation plus estimates of start-up and sustaining costs for new efforts.

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Program Element: #1001004F
PE Title: International Activities

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Work Performed By: Leading US civil servant, military, and contractor scientists, engineers and administrators. The Chief of the International Programs Division in the Office of the Assistant Secretary of the Air Force (Acquisition) administers the program.
- (U) Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Other Appropriation Funds: Not Applicable.
- (U) International Cooperative Agreements: This program deals entirely with International Cooperative Research, Development, Test and Acquisition. It implements USAF obligations to our allies, alliances which are treaty commitments and cooperative initiatives aimed at securing shared systems benefits and savings as directed by USC Title 10 and DODD 5000.1 & 5000.2. STC support is based on STC Charter signed in 1963 by all NATO countries. VKI support is based on NATO funding agreements signed in 1959 which commit US to share funding with 13 other NATO countries. AGARD support is based on AGARD Charter signed in 1971 by all NATO countries. ICRD&A support is based on U.S.C., Title 10, Section 2350a and numerous international agreements and programs signed at the Secretary or Deputy Secretary of Defense level.

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**FY 1992 PROJECTS FOR INSTALLATION OF
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION EQUIPMENT**

<u>PGRM</u> <u>ELEM #</u>	<u>PROJECT #</u>	<u>PROJECT TITLE</u>	<u>BASE</u>	<u>COST</u> <u>(\$000)</u>	<u>PAGE #</u>
6.22.03F	ZHTV922211P1	Install High Mach Advanced Propulsion Research Equip	Wright-Patterson	485	1
6.32.69F	ZHTV922209	Install High Temperature, High Acoustic Equipment	Wright-Patterson	2,360	3
6.58.07F	ANZY940067P1	Install Aeropropulsion Systems Test Facility Icing System, Phase 1	Arnold	77	4

TOTAL RDT&E EQUIPMENT INSTALLATION: \$2,922
(Includes equipment cost)

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1. COMPONENT AIR FORCE		FY 1992 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON			4. PROJECT TITLE INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQP PHASE1		
5. PROGRAM ELEMENT 6.22.03 F	6. CATEGORY CODE 318-612	7. PROJECT NUMBER ZHTV922211P1	8. PROJECT COST(\$000) 187.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL HIGH MACH ADVANCED PROPULSION					
RESEARCH EQUIPMENT, PHASE 1		LS			170.0
SECONDARY UTILITIES		LS			(136.0)
NON-STRUCTURAL MODIFICATIONS		LS			(34.0)
SUBTOTAL					170.0
CONTINGENCY (10%)					17.0
TOTAL CONTRACT COST					187.0
TOTAL FUNDED COST					187.0
RDT&E EQUIPMENT					298.0
TOTAL COST					485.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93	FY94	FY95	
485		450	250	120	
<p>"This facility is government operated. Phase 1 will be constructed with FY92 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."</p>					
10. Description of Proposed Construction: Install piping and valves, modify secondary electrical power system, installation of air heaters, and perform building penetrations as necessary.					
11. REQUIREMENT: As required.					
PROJECT: Modify the Wright Laboratory, Aero Propulsion and Power Directorate Facility, Bldg 18E, Test Cell 22, to allow the installation of a High Mach, Advanced Propulsion Research equipment.					
REQUIREMENT: A facility is required to conduct applied research and development in combined cycle propulsion used for manned and unmanned hypersonic vehicles. The High Mach, Advanced Propulsion Research equipment will provide the capability to determine combustion performance of various air-breathing engine configurations on a direct-connect ramjet thrust stand. The installation of a new fuel system to operate the combustors with fuels of the correct molecular compositions and physical properties for flight conditions up to Mach 6 will enhance this capability. Facility requirements include plumbing for fuel lines and electrical power for control of valves and air heaters which will help simulate the high temperatures these engines will be encountering at high altitudes.					
CURRENT SITUATION: There are no facilities which have the necessary environmental and utility systems necessary to install this state-of-the-art equipment. Research with large-scale combined cycle combustors using realistic fuels for these flight conditions is a new R&D effort.					
IMPACT IF NOT PROVIDED: Research and development of new technology engines capable of performing in speeds up to Mach 6 will not be possible. The Air Force would have to rely on other countries for this technology,					

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1. COMPONENT	FY 1992 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
WRIGHT-PATTERSON		
4. PROJECT TITLE	5. PROJECT NUMBER	
INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQP PHASE1	ZHTV922211P1	
<p>jeopardizing its position as a world leader in propulsion systems.</p> <p><u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT AIR FORCE		FY 1992 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL HIGH TEMPERATURE, HIGH ACOUSTIC EQUIPMENT		
5. PROGRAM ELEMENT 6.32.69 F	6. CATEGORY CODE 310-912	7. PROJECT NUMBER ZHTV922209	8. PROJECT COST(\$000) 1,860.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL HIGH TEMPERATURE, HIGH ACOUSTIC EQUIPMENT		LS			1,690.9
SECONDARY UTILITIES		LS			(1,352.7)
NON-STRUCTURAL MODIFICATIONS		LS			(338.2)
SUBTOTAL					1,690.9
CONTINGENCY (10%)					169.1
TOTAL CONTRACT COST					1,860.0
TOTAL FUNDED COST					1,860.0
RDT&E EQUIPMENT					500.0
TOTAL COST					2,360.0
<p>"This facility is government operated. This facility is planned to be constructed with FY92 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."</p>					
10. Description of Proposed Construction: Install 15 megawatt substation, silicone-controlled rectifiers, high voltage cables, low voltage bus, and all necessary support.					
11. REQUIREMENT: As required.					
PROJECT: Modify the Wright Laboratory, Flight Dynamics Directorate, Bldg 461, to perform high temperature/acoustic tests.					
REQUIREMENT: A facility is required to perform high temperature, high acoustic tests for the National Aero-Space Plane (NASP), B-2 Bomber, and other high performance vehicles. Hypersonic aircraft must endure extremely intense heat flux and high acoustic levels. This facility must provide sufficient power for several power heaters that will provide the heat flux.					
CURRENT SITUATION: There are no facilities capable of providing adequate electrical power necessary to perform tests on hypersonic aircraft. Research and development in the area of hypersonic aircraft is a new mission requirement for Wright Laboratories.					
IMPACT IF NOT PROVIDED: Structures designed for hypersonic flight will not be tested. The NASP and next generation aircraft will not have the test facilities to prove their advanced structures will be effective in the harsh environment in which they operate. The US would have to depend on foreign nations for research and development of hypersonic aircraft.					
ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".					

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1. COMPONENT AIR FORCE		FY 1992 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE			4. PROJECT TITLE INSTALL AEROPROPULSION SYSTEMS TEST FACILITY ICING SYSTEM PH1		
5. PROGRAM ELEMENT 6.58.07 F	6. CATEGORY CODE 318-614	7. PROJECT NUMBER ANZY940067P1	8. PROJECT COST(\$000) 77.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL AEROPROPULSION SYSTEMS TEST					
FACILITY ICING SYSTEM, PHASE 1		LS			77.0
DESIGN		LS			(77.0)
SUBTOTAL					77.0
TOTAL CONTRACT COST					77.0
TOTAL FUNDED COST					77.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93	FY94	FY95	
77		758	1358	1222	
"This facility is government operated. Phase 1 will be constructed with FY93 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."					
10. Description of Proposed Construction: This phase provides design funds for phases 2, 3 and 4.					
11. REQUIREMENT: As required. PROJECT: Install an Aeropropulsion System Test Facility (ASTF) Icing System in Bldg 912. REQUIREMENT: The ASTF requires installation of a system that will allow testing of engines during simulated icing conditions at different altitudes and atmospheric conditions. This cell must accomodate large test articles, providing seasonal conditions, consistent with accepted DoD/FAA atmospheric characteristics. Installation of the system will require installation of water lines, valves, pumps, a water storage tank, and all controls necessary to inject freezing water into the engine during testing. CURRENT SITUATION: There are no facilities in the world which can test large, high mass flow test articles, such as engines, for icy conditions at simulated atmospheric conditions. Testing currently occurs at sea level, a method which cannot accurately simulate the conditions an aircraft engine will be exposed to during harsh weather conditions. Test results are therefore questionable at best. IMPACT IF NOT PROVIDED: Testing for icing conditions will continue to be performed at outdoor, sea level facilities, providing inaccurate data on simulated flight conditions. Development of advanced engine technology which must perform at faster speeds and higher altitudes may be jeopardized. Critical data on the performance of existing aircraft may not be obtained. ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for					

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1. COMPONENT	FY 1992 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
ARNOLD AIR FORCE BASE, TENNESSEE		
4. PROJECT TITLE	5. PROJECT NUMBER	
INSTALL AEROPROPULSION SYSTEMS TEST FACILITY ICING SYSTEM PH1	ANZY940067P1	
<p>this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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**FY 1993 FACILITIES REQUIRED BY A CONTRACTOR TO PERFORM A
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION CONTRACT
IN ACCORDANCE WITH 10 USC 2353**

<u>PRGM ELEM #</u>	<u>PROJECT #</u>	<u>PROJECT TITLE</u>	<u>BASE</u>	<u>COST (\$000)</u>	<u>PAGE #</u>
3.41.11F	XUMU921119	Modify Solid Rocket Motor Facilities (Martin-Marietta)	Vandenberg	2,000	1
3.41.11F	XUMU921141	Fairing Processing and Encapsulation Facility (General Dynamics)	Vandenberg	15,000	2

TOTAL CONTRACTOR RDT&E: \$17,000

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1. COMPONENT AIR FORCE		FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION VANDENBERG AIR FORCE BASE, CALIFORNIA			4. PROJECT TITLE MODIFY SOLID ROCKET MOTOR FACILITIES		
5. PROGRAM ELEMENT 3.41.11 F	6. CATEGORY CODE 390-531	7. PROJECT NUMBER XUMU921119	8. PROJECT COST(\$000) 2,000.0		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
MODIFY SOLID ROCKET MOTOR FACILITIES	LS			1,715.3	
MODIFY PAD DECK	LS			(1,000.0)	
MODIFY RIS CRANE	LS			(715.3)	
SUBTOTAL				1,715.3	
CONTINGENCY (10%)				171.5	
TOTAL CONTRACT COST				1,886.8	
SUPERVISION, INSPECTION AND OVERHEAD (6%)				113.2	
TOTAL FUNDED COST				2,000.0	
<p>"This facility is planned to be constructed with FY93 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."</p>					
10. Description of Proposed Construction: Reinforce concrete/steel pad deck, modify rocket inspection and servicing (RIS) crane, electrical modifications, and all necessary support.					
11. REQUIREMENT: As required.					
<p><u>PROJECT:</u> Modify the pad deck at SLC 4E to support the solid rocket motor upgrade (SRMU) program, and modify the RIS crane at Bldg 945 for the existing solid rocket motor (SRM) segments.</p> <p><u>REQUIREMENT:</u> Launching of the Titan IV with the new SRMU segments at Space Launch Complex (SLC) 4E requires a reinforced pad deck, capable of handling the loads created by the new segments. The pad deck must withstand both the weight of the segments being transported over the deck, and the full blast of Titan IV motors. The deck protects valuable equipment located in the Launch Service Building (underneath the pad deck). The RIS crane must be capable of processing current SRM segments, in full compliance with safety regulations.</p> <p><u>CURRENT SITUATION:</u> The existing pad deck was designed to withstand loads created by the current SRM segments. It is not capable of handling the new rocket motors. The existing RIS crane does not meet current safety standards.</p> <p><u>IMPACT IF NOT PROVIDED:</u> SRMU segments will not be transported to SLC 4E, prohibiting launch highly critical DoD payloads. RIS operations may be delayed or stopped until the safety deficiencies are corrected.</p> <p><u>ADDITIONAL:</u> 10 USC 2353 authorizes the use of RDT&E funds to construct facilities necessary for the performance of a contract. This project will support the prime contractor and systems integrator for the Titan IV program, Martin Marietta. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>					

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1. COMPONENT AIR FORCE		FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION VANDENBERG AIR FORCE BASE, CALIFORNIA			4. PROJECT TITLE FAIRING PROCESSING AND ENCAPSULATION FACILITY		
5. PROGRAM ELEMENT 3.41.11 F	6. CATEGORY CODE 312-477	7. PROJECT NUMBER XUMU921141	8. PROJECT COST(\$000) 15,000.0		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
FAIRING PROCESSING AND ENCAPSULATION FACILITY	SF	12,000	624	7,488.0	
SUPPORTING FACILITIES				5,989.0	
UTILITIES	LS			(2,501.0)	
PAVEMENTS	LS			(1,145.0)	
SITE IMPROVEMENTS	LS			(1,101.0)	
20 TON BRIDGE CRANE	LS			(245.0)	
COMMUNICATIONS SUPPORT	LS			(997.0)	
SUBTOTAL				13,477.0	
CONTINGENCY (5%)				673.9	
TOTAL CONTRACT COST				14,150.9	
SUPERVISION, INSPECTION AND OVERHEAD (6%)				849.1	
TOTAL FUNDED COST				15,000.0	
<p>"This facility is planned to be constructed with FY93 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."</p>					
10. Description of Proposed Construction: Metal or concrete masonry structure with low and high bays, HVAC and controls, built-up roofing, intrusion detection system, security fencing, voice/data systems wiring, latrines, fire detection/protection system, paved concrete apron, access roads, and all necessary utilities.					
11. REQUIREMENT: As required. <u>PROJECT:</u> Construct a Fairing Processing and Encapsulation Facility for the Atlas II/Centaur launch program. <u>REQUIREMENT:</u> A facility is required to process the fairings (or metal skin) necessary to build the Atlas II/Centaur vehicles, and at the same time encapsulate the DoD payloads prior to transporting it to Space Launch Complex (SLC) 3. This facility must provide contractor personnel with adequate height and width to handle the fairings and payloads, clean room capability for the high bay section of the facility, and adequate site conditions to ensure safe handling of the payload. <u>CURRENT SITUATION:</u> A facility does not exist which can process fairings and encapsulate payloads all under one roof. Other facilities at Vandenberg AFB, such as those for the Titan II and IV at SLC-4, are not suitable for the Atlas II/Centaur due to their unique design and distance from SLC-3. Atlas II/Centaur build-up cannot be accomplished at the launch pad because it would tie-up the pad for an extended amount of time. <u>IMPACT IF NOT PROVIDED:</u> Off-pad processing and encapsulation of Atlas II/Centaur systems will not be possible. These functions would have to be accomplished at SLC-3, causing major delays between scheduled launches of critical DoD payloads. <u>ADDITIONAL:</u> 10 USC 2353 authorizes the use of RDT&E funds to construct facilities necessary for the performance of a contract. This project will					

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1. COMPONENT	FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
VANDENBERG AIR FORCE BASE, CALIFORNIA		
4. PROJECT TITLE		5. PROJECT NUMBER
FAIRING PROCESSING AND ENCAPSULATION FACILITY		XUMU921141
<p>support the prime contractor and systems integrator for the Atlas II/Centaur program, General Dynamics. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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**FY 1993 PROJECTS FOR INSTALLATION OF
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION EQUIPMENT
IN ACCORDANCE WITH DODI 7110.1-M**

<u>PGRM</u> <u>ELEM #</u>	<u>PROJECT #</u>	<u>PROJECT TITLE</u>	<u>BASE</u>	<u>COST</u> <u>(\$000)</u>	<u>PAGE #</u>
6.22.03F	ZHTV922211P2	Install High Mach Advanced Wright-Patterson Propulsion Research Equip, Phase 2		450	1
6.58.07F	ANZY940067P2	Install Aeropropulsion Systems Test Facility Icing System, Phase 2	Arnold	758	3
VARIOUS	ANZY933008P1	Modify Hypersonic/Supersonic Wind Tunnel Control Rooms, Phase 1	Arnold	200	5

TOTAL RDT&E EQUIPMENT INSTALLATION: \$1,408
(Includes equipment cost)

1. COMPONENT AIR FORCE		FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQP PHASE2		
5. PROGRAM ELEMENT 6.22.03 F	6. CATEGORY CODE 318-612	7. PROJECT NUMBER ZHTV922211P2	8. PROJECT COST(\$000) 155.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL HIGH MACH ADVANCED PROPULSION					
RESEARCH EQUIPMENT, PHASE 2		LS			140.9
SECONDARY UTILITIES		LS			(112.9)
NON-STRUCTURAL MODIFICATIONS		LS			(28.0)
SUBTOTAL					140.9
CONTINGENCY (10%)					14.1
TOTAL CONTRACT COST					155.0
TOTAL FUNDED COST					155.0
RDT&E EQUIPMENT					295.0
TOTAL COST					450.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93		FY94	
485		450		250	
				FY95	
				120	
<p>"This facility will be government operated. Phase 2 is planned to be constructed with FY93 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."</p>					
10. Description of Proposed Construction: Install piping and valves, modify secondary electrical power system, installation of air heaters, and perform building penetrations as necessary.					
11. REQUIREMENT: As required.					
<p><u>PROJECT:</u> Modify the Wright Laboratory, Aero Propulsion and Power Directorate Facility, Bldg 18E, Test Cell 22, to allow the installation of a High Mach, Advanced Propulsion Research equipment.</p> <p><u>REQUIREMENT:</u> A facility is required to conduct applied research and development in combined cycle propulsion used for manned and unmanned hypersonic vehicles. The High Mach, Advanced Propulsion Research equipment will provide the capability to determine combustion performance of various air-breathing engine configurations on a direct-connect ramjet thrust stand. The installation of a new fuel system to operate the combustors with fuels of the correct molecular compositions and physical properties for flight conditions up to Mach 6 will enhance this capability. Facility requirements include plumbing for fuel lines and electrical power for control of valves and air heaters which will help simulate the high temperatures these engines will be encountering at high altitudes.</p> <p><u>CURRENT SITUATION:</u> There are no facilities which have the necessary environmental and utility systems necessary to install this state-of-the-art equipment. Research with large-scale combined cycle combustors using realistic fuels for these flight conditions is a new R&D effort.</p> <p><u>IMPACT IF NOT PROVIDED:</u> Research and development of new technology engines capable of performing in speeds up to Mach 6 will not be possible. The Air Force would have to rely on other countries for this technology,</p>					

1. COMPONENT AIR FORCE	FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE 01 OCT 1992
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO		
4. PROJECT TITLE INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQP PHASE2	5. PROJECT NUMBER ZHTV922211P2	
<p>jeopardizing its position as a world leader in propulsion systems.</p> <p><u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT AIR FORCE		FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE			4. PROJECT TITLE INSTALL AEROPROPULSION SYSTEMS TEST FACILITY ICING SYSTEM PH2		
5. PROGRAM ELEMENT 6.58.07 F	6. CATEGORY CODE 318-614	7. PROJECT NUMBER ANZY940067P2	8. PROJECT COST(\$000) 122.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL AEROPROPULSION SYSTEMS TEST		LS			110.9
FACILITY ICING SYSTEM, PHASE 2		LS			(94.9)
SECONDARY UTILITIES		LS			(16.0)
NON-STRUCTURAL MODIFICATIONS		LS			(16.0)
SUBTOTAL					110.9
CONTINGENCY (10%)					11.1
TOTAL CONTRACT COST					122.0
TOTAL FUNDED COST					122.0
DESIGN COST					420.0
RDT&E EQUIPMENT COST					216.0
TOTAL COST					758.0
TOTAL OBLIGATION AUTHORITY (\$000)					
<u>FY92</u>		<u>FY93</u>	<u>FY94</u>	<u>FY95</u>	
77		758	1,358	1,222	
"This facility is government operated. Phase 2 will be constructed with FY93 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."					
10. Description of Proposed Construction: Install piping, valves, ductwork, nozzles, water storage tank, and all necessary structural and electrical support.					
11. REQUIREMENT: As required.					
<u>PROJECT:</u> Install an Aeropropulsion System Test Facility (ASTF) Icing System in Bldg 912.					
<u>REQUIREMENT:</u> The ASTF requires installation of a system that will allow testing of engines during simulated icing conditions at different altitudes and atmospheric conditions. This cell must accomodate large test articles, providing seasonal conditions, consistent with accepted DoD/FAA atmospheric characteristics. Installation of the system will require installation of water lines, valves, pumps, a water storage tank, and all controls necessary to inject freezing water into the engine during testing.					
<u>CURRENT SITUATION:</u> There are no facilities in the world which can test large, high mass flow test articles, such as engines, for icy conditions at simulated atmospheric conditions. Testing currently occurs at sea level, a method which cannot accurately simulate the conditions an aircraft engine will be exposed to during harsh weather conditions. Test results are therefore questionable at best.					
<u>IMPACT IF NOT PROVIDED:</u> Testing for icing conditions will continue to be performed at outdoor, sea level facilities, providing inaccurate data on simulated flight conditions. Development of advanced engine technology which must perform at faster speeds and higher altitudes may be jeopardized. Critical data on the performance of existing aircraft may not be obtained.					
<u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support					

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1. COMPONENT	FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
ARNOLD AIR FORCE BASE, TENNESSEE		
4. PROJECT TITLE	5. PROJECT NUMBER	
INSTALL AEROPROPULSION SYSTEMS TEST FACILITY ICING SYSTEM PH2	ANZY940067P2	
<p>RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT AIR FORCE		FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)				2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE				4. PROJECT TITLE MODIFY HYPERSONIC/SUPERSONIC WIND TUNNEL CONTROL ROOMS PH1			
5. PROGRAM ELEMENT VARIOUS		6. CATEGORY CODE 311-115		7. PROJECT NUMBER ANZY933008P1		8. PROJECT COST(\$000) 200.0	
9. COST ESTIMATES							
ITEM				U/M	QUANTITY	UNIT COST	COST (\$000)
MODIFY HYPERSONIC/SUPERSONIC WIND TUNNEL CONTROL ROOMS, PHASE 1				LS			200.0
DESIGN				LS			(200.0)
SUBTOTAL							200.0
TOTAL CONTRACT COST							200.0
TOTAL FUNDED COST							200.0
TOTAL OBLIGATION AUTHORITY (\$000)							
FY92		FY93		FY94		FY95	
0		200		3800		2000	
<p>"This facility will be government operated. Phase 1 will be constructed with FY93 funding, with construction to proceed 30 days after submittal of this budget request unless notification to the contrary is received from the subcommittee."</p>							
10. Description of Proposed Construction: This phase provides design funding for phases 2 & 3.							
11. REQUIREMENT: As required.							
PROJECT: Modify Hypersonic/Supersonic Wind Tunnel Control Rooms in Bldg 676.							
<p>REQUIREMENT: Two centralized control rooms are required to conduct aerodynamic wind tunnel testing for one supersonic and two hypersonic test units, known as Tunnels A, B, and C. All model attitude controls, model support system actuation, video systems, health monitoring devices, data acquisition and production, and attendant wiring systems must be provided in two consolidated areas in order to effectively control each test. Facility must provide security barriers and alarms systems which would permit the use of more than one test unit during classified testing. Data room and computer room must allow for the interaction with data, displays, communication with the test team, and coordination of the tests, increasing efficiency and production.</p>							
<p>CURRENT SITUATION: The Hypersonic/Supersonic Wind Tunnel Facility contains three separate control rooms, one for each tunnel. Each room is similar in size, function and operation, and contains common equipment such as minicomputers, printers, plotters, facility computers, and test support hardware. Since there is only one government crew available to operate these tunnels, tests can only be performed one at a time. This severely restricts testing during periods when several DoD programs are being developed. In addition, there is only one data analysis room, located in control room "A". When the government is performing classified work, unclassified data analysis being conducted by contractor personnel must be ceased, subsequently reducing user occupancy hours. Noise in the</p>							

1. COMPONENT AIR FORCE	FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE 01 OCT 1992
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE		
4. PROJECT TITLE MODIFY HYPERSONIC/SUPERSONIC WIND TUNNEL CONTROL ROOMS PH1		5. PROJECT NUMBER ANZY933008P1
<p>control rooms and lack of automation leads to confusion and inefficiency. <u>IMPACT IF NOT PROVIDED:</u> Test units A, B, and C will continue to operate inefficiently. User occupancy hours will continue to be limited, possibly delaying development of major DoD programs, such as the NASP, SDI, and SRAM II. Security of weapons systems data could be compromised. <u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

**FY 1994 FACILITIES REQUIRED BY A CONTRACTOR TO PERFORM A
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION CONTRACT
IN ACCORDANCE WITH 10 USC 2353**

<u>PRGM ELEM #</u>	<u>PROJECT #</u>	<u>PROJECT TITLE</u>	<u>BASE</u>	<u>COST (\$000)</u>	<u>PAGE #</u>
3.41.11F	XUMU921120	Add/Alter Space Launch Complex 4E, Titan IV Pgm (Martin-Marietta)	Vandenberg	2,000	1
3.41.11F	XUMU921123	Add to Launch Service Fac (Martin-Marietta)	Vandenberg	7,900	3
3.41.11F	XUMU921139P3	Space Launch Complex 3E Atlas II Conversion, Phase 3 (General Dynamics)	Vandenberg	<u>15,000</u>	5

TOTAL CONTRACTOR RDT&E: \$24,900

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION VANDENBERG AIR FORCE BASE, CALIFORNIA			4. PROJECT TITLE ADD TO AND ALTER SPACE LAUNCH COMPLEX 4E, TITAN IV PROGRAM		
5. PROGRAM ELEMENT 3.41.11 F	6. CATEGORY CODE 312-477	7. PROJECT NUMBER XUMU921120	8. PROJECT COST (\$000) 2,000.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
ADD TO AND ALTER SPACE LAUNCH COMPLEX 4E, TITAN IV PROGRAM		LS			1,715.3
REHAB CHILLED WATER STUB-UPS		LS			(15.4)
MODIFY UNDERCARRIAGE		LS			(595.0)
MODIFY JACKING SYSTEM		LS			(680.0)
CONSTRUCT BERM		LS			(424.9)
SUBTOTAL					1,715.3
CONTINGENCY (10%)					171.5
TOTAL CONTRACT COST					1,886.8
SUPERVISION, INSPECTION AND OVERHEAD (6%)					113.2
TOTAL FUNDED COST					2,000.0
10. Description of Proposed Construction: Replace caps and insulate the chilled water stub-up connections, modify Mobile Service Tower (MST) undercarriage access, modify the hydraulic jacking system potentiometers, install a containment berm, and all necessary support.					
11. REQUIREMENT: As required. <u>PROJECT:</u> Add and alter Space Launch Complex 4E for Titan IV Program. <u>REQUIREMENT:</u> Chilled Water stub-ups must be protected from launch blast pressure and heat flash which causes corrosion. Undercarriage access is required to provide personnel a safe way of performing maintenance and repairs to the slide block actuators. Jacking system height potentiometers need to be placed in an accessible area, away from other instrumentation in order to obtain maximum reliability. The County of Santa Barbara Air Pollution Control District requires that the Solid Rocket Motor (SRM) Support Equipment Facility provide a permanent berm to adequately contain hazardous chemicals. <u>CURRENT SITUATION:</u> Water stub-up connections are suffering from severe corrosion due to the extreme blast pressure and heat flash produced by each vehicle launch. This corrosion eventually will damage the water line, and shut down payload processing in the MST due to lack of cooling and humidity control. Maintenance personnel gain undercarriage access to the slide block actuators by climbing over and around structural steel support members and equipment. Since workers must concentrate on maintaining a sure footing, they can not adequately handle heavy objects, parts and tools. Safety harnesses are not practical to use, since the fall is shorter than the length of the safety line. Ladders do not provide access to major work areas around the actuators. Potentiometers are mounted in an explosion proof housing and connected to the MST height					

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1. COMPONENT AIR FORCE	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE 01 OCT 1992
3. INSTALLATION AND LOCATION VANDENBERG AIR FORCE BASE, CALIFORNIA		
4. PROJECT TITLE ADD TO AND ALTER SPACE LAUNCH COMPLEX 4E, TITAN IV PROGRAM	5. PROJECT NUMBER XUMU921120	
<p>dial indicators by a shaft. When the housing becomes loose or misaligned, the shaft binds and causes the height dial indicator to bind or freeze. Sand bags are currently used in the SRM Support Equipment Facility to contain spills. This deficiency was identified during a recent Environmental Compliance Assessment and Management Plan (ECAMP) inspection.</p> <p><u>IMPACT IF NOT PROVIDED:</u> Chilled water stub-ups will continue to deteriorate, jeopardizing environmental controls in the MST, and possibly delaying launch dates. Maintenance workers will continue to experience difficulty accessing the slide block actuators. The potential for a safety hazard will continue to exist. Efficiency of the workers will not improve. If a dial indicator shaft binds or freezes, the manual and automatic modes for verifying tower clearances will become inoperative, causing repair delays which could postpone launch dates. The SLC-4E could be issued a notice of violation (NOV) for failing to provide adequate protection against fuel spills.</p> <p><u>ADDITIONAL:</u> 10 USC 2353 authorizes the use of RDT&E funds to construct facilities necessary for the performance of a contract. This project will support the prime contractor and systems integrator for the Titan IV program, Martin Marietta. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 0 1 OCT 1992	
3. INSTALLATION AND LOCATION VANDENBERG AIR FORCE BASE, CALIFORNIA			4. PROJECT TITLE ADD TO LAUNCH SERVICE FACILITY		
5. PROGRAM ELEMENT 3.41.11 F	6. CATEGORY CODE 390-531	7. PROJECT NUMBER XUMU921123	8. PROJECT COST(\$000) 7,900.0		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
ADD TO LAUNCH SERVICE FACILITY	SF	7,000	607	4,249.0	
SUPPORTING FACILITIES				2,848.9	
UTILITIES	LS			(1,780.0)	
PAVEMENTS	LS			(530.0)	
SITE IMPROVEMENTS	LS			(538.9)	
SUBTOTAL				7,097.9	
CONTINGENCY (5%)				354.9	
TOTAL CONTRACT COST				7,452.8	
SUPERVISION, INSPECTION AND OVERHEAD (6%)				447.2	
TOTAL FUNDED COST				7,900.0	
10. Description of Proposed Construction: Reinforced concrete walls and roof; heating, ventilation, and air conditioning; lighting; secondary electrical power supply; and all necessary support.					
11. REQUIREMENT: As required. PROJECT: Construct an addition to the Space Launch Complex (SLC) 4E, Launch Service Building (LSB). REQUIREMENT: Additional space is required in the LSB to house Launch Overpressure Instrumentation System (LOIS) and Programmable Aerospace Ground Equipment (PAGE). These two new systems, essential for launching research and development payloads using the Titan IV space launch vehicles, require on-pad space with adequate environmental controls, capable of withstanding launch-induced overpressures. CURRENT SITUATION: There is insufficient space in the existing LSB to house the LOIS and PAGE equipment. This facility is presently overcrowded with operational support equipment, tools, materials, and contractor work space. Operations personnel are located in areas designed for equipment storage, some of which contain high voltage electrical systems. Adjacent emergency egress tunnels are being used for storage due to the chronic lack of space. These conditions often violate Life Safety Codes, resulting in contractor work stoppages, and eventually, delays to the launch program. IMPACT IF NOT PROVIDED: LOIS and PAGE equipment will not be installed in the LSB. Contractor personnel will not be able to perform essential launch preparation activities. Life Safety violations throughout the LSB will force the shut-down of launch preparations, possibly delaying the launch of critical DoD classified payloads. ADDITIONAL: 10 USC 2353 authorizes the use of RDT&E funds for the					

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UNCLASSIFIED		2. DATE
1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	01 OCT 1992
3. INSTALLATION AND LOCATION		
VANDENBERG AIR FORCE BASE, CALIFORNIA		
4. PROJECT TITLE		5. PROJECT NUMBER
ADD TO LAUNCH SERVICE FACILITY		XUMU921123
<p>construction of contractor R&D facilities necessary for the performance of a contract. This project will support the prime contractor and systems integrator for the Titan IV program, Martin Marietta. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION VANDENBERG AIR FORCE BASE, CALIFORNIA		4. PROJECT TITLE SPACE LAUNCH COMPLEX-3E ATLAS II CONVERSION PHASE 3			
5. PROGRAM ELEMENT 3.41.11 F	6. CATEGORY CODE 312-477	7. PROJECT NUMBER XUMU921139P3	8. PROJECT COST(\$000) 15,000.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
SPACE LAUNCH COMPLEX-3E ATLAS II CONVERSION, PHASE 3		LS			13,477.0
SUBTOTAL					13,477.0
CONTINGENCY (5%)					673.9
TOTAL CONTRACT COST					14,150.9
SUPERVISION, INSPECTION AND OVERHEAD (6%)					849.1
TOTAL FUNDED COST					15,000.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93		FY94	
35,000		120,000		15,000	
				FY95	
				0	
"Phases 1 and 2 were submitted as part of the FY92 and FY93 President's Budget, respectively."					
10. Description of Proposed Construction: Construct a umbilical tower, operations support building, utilities building, technical services building, entry control facility, and duct banks. Modify the launch service building. Includes roads, primary and secondary utility systems, and all necessary support.					
11. REQUIREMENT: As required. PROJECT: Construct and modify several facilities at Space Launch Complex (SLC) 3E for the Atlas II Conversion program. REQUIREMENT: Project is required to provide the Atlas II contractor with launch service facilities, necessary for the delivery of critical government communications, navigation, surveillance, weather, reconnaissance, and early warning satellites into space beginning in 1996. These facilities must provide payload operational support, environmentally controlled payload processing, communications, space vehicle and aerospace ground equipment (AGE) monitoring, and security systems as needed to ensure space vehicles and their payloads can be assembled and launched within a short amount of time. Facilities are an integral part of the launch complex, and must be developed, designed, and integrated with the AGE, test support equipment, and launch support systems to ensure risks associated with the conversion of this complex is minimized. CURRENT SITUATION: Atlas II launch capabilities are not available from Vandenberg AFB. Existing facilities at SLC-3E are not suitable for the unique design of the Atlas II system. IMPACT IF NOT PROVIDED: Launching of critical government satellites at specified altitudes on a polar orbit using the Atlas II vehicle will not be possible. Launches will be limited to Cape Canaveral AFB, where satellites can achieve equatorial orbits only. This could hamper future					

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1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
VANDENBERG AIR FORCE BASE, CALIFORNIA		
4. PROJECT TITLE	5. PROJECT NUMBER	
SPACE LAUNCH COMPLEX-3E ATLAS II CONVERSION PHASE 3	XUMU921139P3	
<p>operational missions.</p> <p><u>ADDITIONAL:</u> 10 USC 2353 authorizes the use of RDT&E funds to construct facilities necessary for the performance of a contract. This project will support the prime contractor and systems integrator for the Atlas II program, General Dynamics (GD). There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide". ACQUISITION/FUNDING STRATEGY: Since the payload, booster, infrastructure, communications, and test ranges are all under development, facility design and construction requirements are not well defined. To minimize the risks associated with integrating facilities with systems, a facility "design & construct" strategy was selected. As the design of the space vehicle and support systems are developed, GD will provide the necessary facilities. Facilities will be funded incrementally from FY92 to FY94 to ensure a launch date of 1996 is achieved.</p>		

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**FY 1994 PROJECTS FOR INSTALLATION OF
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION EQUIPMENT**

<u>PGRM ELEM #</u>	<u>PROJECT #</u>	<u>PROJECT TITLE</u>	<u>BASE</u>	<u>COST (\$000)</u>	<u>PAGE #</u>
6.22.03F	ZHTV922211P3	Install High Mach Advanced Propulsion Research Equip	Wright-Patterson	250	1
6.22.03F	ZHTV942201	Install Structures Research Equipment	Wright-Patterson	4,200	3
6.22.03F	ZHTV942202	Install Electro-Mechanical Research Laboratory Equip	Wright-Patterson	925	4
6.22.03F	ZHTV942203	Install More Electric Aircraft Research Equip	Wright-Patterson	1,050	6
6.22.04F	ZHTV889101	Install Radar Signal Processing Lab Equip	Wright-Patterson	800	7
6.22.04F	ZHTV889113P2	Install Environmental Control System for Semi-Conductor Research, Phase 2	Wright-Patterson	950	9
6.22.04F	ZHTV889115P2	Install Molecular Beam Epitaxial System, Phase 2	Wright-Patterson	575	10
6.58.07F	ANZY900216P5	Install Test Unit Support System, Phase 5	Arnold	876	12
6.58.07F	ANZY940067P3	Install Aeropropulsion Systems Test Facility Icing System, Phase 3	Arnold	1,358	13
6.58.07F	FSPM942534	Install Weapons Systems Computer Equipment	Edwards	806	15
6.58.07F	ZHTV942200	Install Ventilation for Aircraft Modification Fac	Wright-Patterson	636	16
VARIOUS	ANZY933008P2	Modify Hypersonic/Supersonic Wind Tunnel Control Rooms, P2	Arnold	<u>3,800</u>	18
TOTAL RDT&E EQUIPMENT INSTALLATION:				\$16,226	
(Includes equipment cost)					

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQP PHASE3		
5. PROGRAM ELEMENT 6.22.03 F	6. CATEGORY CODE 318-612	7. PROJECT NUMBER ZHTV922211P3	8. PROJECT COST(\$000) 87.5		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQUIPMENT, PHASE 3		LS			79.5
SECONDARY UTILITIES		LS			(63.5)
NON-STRUCTURAL MODIFICATIONS		LS			(16.0)
SUBTOTAL					79.5
CONTINGENCY (10%)					8.0
TOTAL CONTRACT COST					87.5
TOTAL FUNDED COST					87.5
RDT&E EQUIPMENT					162.5
TOTAL COST					250.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93	FY94	FY95	
485		450	250	120	
"This facility will be government operated."					
10. Description of Proposed Construction: Install piping and valves modify secondary electrical power system, installation of air heaters, and perform building penetrations as necessary.					
11. REQUIREMENT: As required. PROJECT: Modify the Wright Laboratory, Aero Propulsion and Power Directorate Facility, Bldg 18E, Test Cell 22, to allow the installation of a High Mach, Advanced Propulsion Research equipment. REQUIREMENT: A facility is required to conduct applied research and development in combined cycle propulsion used for manned and unmanned hypersonic vehicles. The High Mach, Advanced Propulsion Research equipment will provide the capability to determine combustion performance of various air-breathing engine configurations on a direct-connect ramjet thrust stand. The installation of a new fuel system to operate the combustors with fuels of the correct molecular compositions and physical properties for flight conditions up to Mach 6 will enhance this capability. Facility requirements include plumbing for fuel lines and electrical power for control of valves and air heaters which will help simulate the high temperatures these engines will be encountering at high altitudes. CURRENT SITUATION: There are no facilities which have the necessary environmental and utility systems necessary to install this state-of-the-art equipment. Research with large-scale combined cycle combustors using realistic fuels for these flight conditions is a new R&D effort. IMPACT IF NOT PROVIDED: Research and development of new technology engines capable of performing in speeds up to Mach 6 will not be possible. The Air Force would have to rely on other countries for this technology,					

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1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
WRIGHT-PATTERSON AIR FORCE BASE, OHIO		
4. PROJECT TITLE		5. PROJECT NUMBER
INSTALL HIGH MACH ADVANCED PROPULSION RESEARCH EQP PHASE3		ZHTV922211P3
<p>jeopardizing its position as a world leader in propulsion systems.</p> <p><u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
AIR FORCE					
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL STRUCTURES RESEARCH EQUIPMENT		
5. PROGRAM ELEMENT 6.22.03 F	6. CATEGORY CODE 318-612	7. PROJECT NUMBER ZHTV942201	8. PROJECT COST (\$000) 1,200.0		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
INSTALL STRUCTURES RESEARCH EQUIPMENT	LS			1,090.9	
SECONDARY UTILITIES	LS			(445.4)	
HVAC	LS			(645.5)	
SUBTOTAL				1,090.9	
CONTINGENCY (10%)				109.1	
TOTAL CONTRACT COST				1,200.0	
TOTAL FUNDED COST				1,200.0	
RDT&E EQUIPMENT				3,000.0	
TOTAL COST				4,200.0	
"This facility will be government operated."					
10. Description of Proposed Construction: Upgrade secondary electrical power system, modify HVAC system, and all necessary support.					
11. REQUIREMENT: As required. PROJECT: Modify the Wright Laboratory, Aero Propulsion and Power Directorate facility, Bldg 252, to allow for the installation of Structures Research Laboratory equipment. REQUIREMENT: A facility is required to allow basic and exploratory structural research on turbine engine component sub-elements to be conducted. This equipment will provide a means to improve design techniques, validate turbine engine component design codes and increase performance of future aircraft engines. equipment and environmental controls necessary to simulate the conditions in which engines will be performing under. CURRENT SITUATION: There are no facilities in the U S which can be used to perform structural research on advanced turbine engine component sub-elements. This is a new mission requirement, aimed at improving turbine engine performance. IMPACT IF NOT PROVIDED: Structural research on turbine engine component sub-elements to improve aircraft engine performance will not be accomplished. The U.S. would have to depend on foreign nations for research and development of advanced turbine engines, compromising our leadership in this effort. ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support R&D equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".					

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1. COMPONENT		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
AIR FORCE					
3. INSTALLATION AND LOCATION			4. PROJECT TITLE		
WRIGHT-PATTERSON AIR FORCE BASE, OHIO			INSTALL ELECTRO-MECHANICAL RESEARCH LABORATORY EQUIPMENT		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST (\$000)		
6.22.03 F	315 015	ZHTV942202	400.0		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
INSTALL ELECTRO-MECHANICAL RESEARCH LABORATORY EQUIPMENT	LS			363.6	
SECONDARY UTILITIES	LS			(116.4)	
HVAC	LS			(174.5)	
SPECIAL FOUNDATIONS	LS			(72.7)	
SUBTOTAL				363.6	
CONTINGENCY (10%)				36.4	
TOTAL CONTRACT COST				400.0	
TOTAL FUNDED COST				400.0	
RDT&E EQUIPMENT				525.0	
TOTAL COST				925.0	
"This facility is government operated."					
10. Description of Proposed Construction: Modify the secondary electrical power system, upgrade the HVAC system, construct special foundations, and install piping as necessary.					
11. REQUIREMENT: As required.					
PROJECT: Modify the Wright Laboratory, Aero Propulsion and Power Directorate facility, Bldg 18B, to allow installation of Electro-Mechanical Research Laboratory equipment.					
REQUIREMENT: A facility is required to allow advanced development associated with new technologies for aircraft electro-mechanical devices and related subsystems to be conducted. Examples of the devices to be investigated include high power density motor/generators, high temperature electro-mechanical devices and new applications for non-lubricated rotor bearings. Performance testing of these devices will also be conducted to investigate efficiency, torque, temperature response and design margins. This facility must provide adequate electrical power, environmental controls, and special foundations capable of supporting these motors/generators.					
CURRENT SITUATION: There is no facility in the United States in which new and innovative electro-mechanical technologies proposed for use in future aircraft auxiliary and secondary power subsystems can be tested. This is a new mission requirement.					
IMPACT IF NOT PROVIDED: Independent verifications of aircraft power subsystems will not be possible. The US would have to depend on foreign nations for research and development of electro-mechanical technologies, jeopardizing its position as a world leader in this area.					
ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support R&D equipment in existing facilities. There is no criteria/scope for this					

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1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
WRIGHT-PATTERSON AIR FORCE BASE, OHIO		
4. PROJECT TITLE	5. PROJECT NUMBER	
INSTALL ELECTRO-MECHANICAL RESEARCH LABORATORY EQUIPMENT	ZHTV942202	
project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".		

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1. COMPONENT AIR FORCE		FY '994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL MORE ELECTRIC AIRCRAFT RESEARCH EQUIPMENT		
5. PROGRAM ELEMENT 6.22.03 F	6. CATEGORY CODE 318-615	7. PROJECT NUMBER ZHTV942203	8. PROJECT COST(\$000) 150.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL MORE ELECTRIC AIRCRAFT RESEARCH EQUIPMENT		LS			136.4
SECONDARY UTILITIES		LS			(109.1)
NON STRUCTURAL MODIFICATIONS		LS			(27.3)
SUBTOTAL					136.4
CONTINGENCY (10%)					13.6
TOTAL CONTRACT COST					150.0
TOTAL FUNDED COST					150.0
RDT&E EQUIPMENT					900.0
TOTAL COST					1,050.0
"This facility is government operated."					
10. Description of Proposed Construction: Install electrical wiring and conduits, transformers, and all structural support.					
11. REQUIREMENT: As required. PROJECT: Modify the Wright Laboratory, Aero Propulsion and Power Directorate facility, Bldg 450, to allow installation of More Electric Aircraft (MEA) research equipment. REQUIREMENT: A facility is required to allow evaluation of the complete power management distribution system for MEA. Investigations will require close simulation of actual aircraft power system components and flight control surfaces. The MEA program will increase the performance and reliability of aircraft by replacing hydraulic systems with electrically operated components, and produce a truly "fly-by-wire" aircraft. Facility must provide conditioned power to aircraft components undergoing testing. CURRENT SITUATION: There is no facility in the U S in which MEA technologies can be effectively evaluated. This is new mission requirement. IMPACT IF NOT PROVIDED: MEA technologies will not be evaluated as a complete system. Individual components being developed and tested by contractors will not be independently evaluated. Integrated ground testing of MEA technologies will not be possible. MEA technology will not be fully integrated in future weapons systems. ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".					

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL RADAR SIGNAL PROCESSING LAB EQUIPMENT		
5. PROGRAM ELEMENT 6.22.04 F	6. CATEGORY CODE 310-932	7. PROJECT NUMBER ZHTV889101	8. PROJECT COST (\$000) 400.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL RADAR SIGNAL PROCESSING LAB EQUIPMENT		LS			363.6
PREFABRICATED PARTITIONS/DIVIDERS		LS			(38.0)
AIR CONDITIONING		LS			(186.6)
SECONDARY UTILITIES		LS			(139.0)
SUBTOTAL					363.6
CONTINGENCY (10%)					36.4
TOTAL CONTRACT COST					400.0
TOTAL FUNDED COST					400.0
RDT&E EQUIPMENT					400.0
TOTAL COST					800.0
"This facility is government operated."					
10. Description of Proposed Construction: Install prefabricated partitions/dividers, air conditioning and secondary utility work.					
11. REQUIREMENT: As required. PROJECT: Modify the Avionics Laboratory, Bldg 620, to allow for the installation of Radar Signal Processing Laboratory (RASPL) equipment. REQUIREMENT: Collocation of the RASPL and the Electronics Combat Simulation Research Laboratory (ECSRL) is required to integrate avionics systems. Scientists and engineers from both laboratories must work together for simultaneous research on equipment and techniques in a secure, realistic threat and mission environment. Facility must provide adequate electrical power and environmental controls necessary for the operation of state-of-the-art computers. CURRENT SITUATION: The RASPL is located in a facility several hundred feet away from the ECSRL. This prevents real-time transfer of data among functions critical to avionics integration. Electronic response times are now being measured in billionths of a second. With these fast electronic response times, the physical separations of these two facilities are causing timing and signal fidelity problems in real-time research simulations tasks. Transmission over the existing facility distances result in delays of 25 times the maximum acceptable. It is now essential to shorten these communication links and achieve high fidelity data flows necessary for attaining totally integrated avionics systems. IMPACT IF NOT PROVIDED: The Air Force technological advantage in the battle arena could be jeopardized. Air crews will be at greater risk because of incomplete avionics integration delaying response time to battle situations, jamming operations and weapons release. Control of the air space could be jeopardized.					

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1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE 01 OCT 1992
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO		
4. PROJECT TITLE INSTALL RADAR SIGNAL PROCESSING LAB EQUIPMENT		5. PROJECT NUMBER ZHTV889101
<p>ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support R&D equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INST ENVIRONMENTAL CONTROL SYS FOR SEMICONDUCTOR RSCH PHASE 2		
5. PROGRAM ELEMENT 6.22.04 F	6. CATEGORY CODE 310-932	7. PROJECT NUMBER ZHTV889113P2	8. PROJECT COST(\$000) 750.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INST ENVIRONMENTAL CONTROL SYSTEM FOR SEMICONDUCTOR RESEARCH, PHASE 2		LS			681.8
SECONDARY UTILITIES		LS			(92.0)
HVAC		LS			(527.0)
NON-STRUCTURAL MODIFICATIONS		LS			(62.8)
SUBTOTAL					681.8
CONTINGENCY (10%)					68.2
TOTAL CONTRACT COST					750.0
TOTAL FUNDED COST					750.0
RDT&E EQUIPMENT					200.0
TOTAL COST					950.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92	FY93	FY94	FY95		
0	975	950	1025		
"This facility will be government operated. Phase 1 was submitted in the FY93 President's Budget."					
10. Description of Proposed Construction: Building penetrations, install air conditioning, secondary electrical work, and all necessary support.					
11. REQUIREMENT: As required. PROJECT: Modify Bldg 620, the Solid State Electronics Directorate, Wright Laboratory, as necessary to test semiconductors for AF applications. REQUIREMENT: An environmentally controlled (clean) room is required to provide in-house development and support of advanced research in microwave, millimeter wave, ultra-high speed analog transistors, digital integrated circuits and advanced electro-optic devices. This room must meet class 100 and class 10 requirements and provide adequate electrical power and HVAC controls necessary to build and test semiconductor devices. CURRENT SITUATION: Nine different air handling systems serve clean room areas. These systems are more than 17 years old and obsolete for present day clean room operations. Steam heat passing over silica jell bed is used for the dehumidification process. Air balancing is difficult to maintain with this many systems and particle contamination is prevalent which affects R&D test results. IMPACT IF NOT PROVIDED: The technical expertise required for planning and implementing technology and sound research and development techniques in analog, digital, and electro-optic electronics will be seriously eroded. This will result in more costly and less timely development of critical device technologies required for tactical and strategic AF missions. ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support R&D equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".					

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 0 1 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL MOLECULAR BEAM EPITAXIAL SYSTEM, PHASE 2		
5. PROGRAM ELEMENT 6.22.04 F	6. CATEGORY CODE 310-932	7. PROJECT NUMBER ZHTV889115P2	8. PROJECT COST(\$000) 500.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL MOLECULAR BEAM EPITAXIAL SYSTEM, PHASE 2		LS			454.5
SECONDARY UTILITIES		LS			(202.0)
HVAC		LS			(202.0)
NON-STRUCTURAL MODIFICATIONS		LS			(50.5)
SUBTOTAL					454.5
CONTINGENCY (10%)					45.5
TOTAL CONTRACT COST					500.0
TOTAL FUNDED COST					500.0
DESIGN COST					75.0
TOTAL COST					575.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93	FY94	FY95	
0		2070	575	0	
"This facility will be government operated. Phase 1 was submitted in the FY93 President's Budget."					
10. Description of Proposed Construction: Install piping and valves modify secondary electrical power system, air conditioning, and perform building penetrations as necessary.					
11. REQUIREMENT: As required. PROJECT: Modify Bldg 620, the Solid State Electronics Directorate, Wright Laboratory, as necessary to install a Metal Organic Molecular Beam Epitaxial System. REQUIREMENT: An environmentally controlled (clean) room is required to provide in-house development and support of advanced research in microwave, millimeter wave, ultra-high speed analog transistors, digital integrated circuits and advanced electro-optic devices. New equipment must complement existing molecular beam epitaxial in-house capability by providing a unique molecular growth technique necessary for the development of advanced state-of-the-art semiconductor device processes. CURRENT SITUATION: Present clean room microfabrication of electronic electro-optic devices and integrated circuits is limited to only molecular beam epitaxial technology. Advanced state-of-the-art device processes must include metal organic molecular beam epitaxial technology to support the full in-house R&D efforts required for complete device development. The existing clean room does not provide an adequate environment for the development of this advanced technology. IMPACT IF NOT PROVIDED: The technical expertise required for planning and implementing technology and sound research and development techniques in analog, digital, and electro-optic electronics will be seriously eroded. This will result in more costly and less timely development of critical device technologies required for tactical and strategic AF missions. ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support R&D					

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1. COMPONENT	2. DATE
AIR FORCE	01 OCT 1992
FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	
3. INSTALLATION AND LOCATION	
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	
4. PROJECT TITLE	5. PROJECT NUMBER
INSTALL MOLECULAR BEAM EPITAXIAL SYSTEM, PHASE 2	ZHTV8P9115P2
<p>equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>	

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE			4. PROJECT TITLE INSTALL TEST UNIT SUPPORT SYSTEM, PHASE 5		
5. PROGRAM ELEMENT 6.58.07 F	6. CATEGORY CODE 318-614	7. PROJECT NUMBER ANZY900216P5	8. PROJECT COST(\$000) 344.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL TEST UNIT SUPPORT SYSTEM, PHASE 5		LS			312.7
RAISED FLOORING & SUSPENDED CEILING		LS			(96.0)
SECONDARY UTILITIES		LS			(193.9)
HVAC		LS			(22.8)
SUBTOTAL					312.7
CONTINGENCY (10%)					31.3
TOTAL CONTRACT COST					344.0
TOTAL FUNDED COST					344.0
RDT&E EQUIPMENT					532.0
TOTAL COST					876.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93	FY94	FY95	
1609		1423	876	164	
"This facility is government operated. Phases 3 and 4 were submitted in the FY92 and 93 President's Budget, respectively."					
10. Description of Proposed Construction: Install transformers, raised flooring, suspended ceiling, piping, and sheet metal work.					
11. REQUIREMENT: As required. PROJECT: Modify Test Units T7, C1, and C2 to allow for the installation of a Test Unit Support System (TUSS). REQUIREMENT: The TUSS is required to automatically control and monitor test article systems utilized in testing turbine engines. Facility must provide safe, reliable and economical operational control of test articles and facility systems during propulsion testing of jet engines. CURRENT SITUATION: The existing test article and facility control systems were designed for extensive manual control prior to the advent of mini and micro computer systems. These systems require manual setup, monitoring, operation and logging during engine testing. These manual interventions in operations consumes excessive amounts of time, electrical energy and jet fuel, and decreases engine life. No other facilities exist which can be used for testing of jet engines. IMPACT IF NOT PROVIDED: Test units will continue to operate inefficiently, consuming excessive amounts of manpower and energy, as well as accelerating wear on jet engines. ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".					

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE			4. PROJECT TITLE INSTALL AEROPROPULSION SYSTEMS TEST FACILITY ICING SYSTEM PH3		
5. PROGRAM ELEMENT 6.58.07 F	6. CATEGORY CODE 318-614	7. PROJECT NUMBER ANZY940067P3	8. PROJECT COST(\$000) 800.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL AEROPROPULSION SYSTEMS TEST		LS			727.3
FACILITY ICING SYSTEM		LS			(255.5)
NON-STRUCTURAL MODIFICATIONS		LS			(429.4)
HVAC		LS			(42.4)
SECONDARY UTILITIES		LS			727.3
SUBTOTAL					72.7
CONTINGENCY (10%)					800.0
TOTAL CONTRACT COST					800.0
TOTAL FUNDED COST					558.0
RDT&E EQUIPMENT					1,358.0
TOTAL COST					
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92		FY93	FY94	FY95	
77		758	1358	1222	
"This facility will be government operated."					
10. Description of Proposed Construction: Install piping, valves, ductwork, nozzles, water storage tank, and all necessary structural and electrical support.					
11. REQUIREMENT: As required.					
PROJECT: Install an Aeropropulsion System Test Facility (ASTF) Icing System in Bldg 912.					
REQUIREMENT: The ASTF requires installation of a system that will allow testing of engines during simulated icing conditions at different altitudes and atmospheric conditions. This cell must accomodate large test articles, providing seasonal conditions, consistent with accepted DoD/FAA atmospheric characteristics. Installation of the system will require installation of water lines, valves, pumps, a water storage tank, and all controls necessary to inject freezing water into the engine during testing.					
CURRENT SITUATION: There are no facilities in the world which can test large, high mass flow test articles, such as engines, for icy conditions at simulated atmospheric conditions. Testing currently occurs at sea level, a method which cannot accurately simulate the conditions an aircraft engine will be exposed to during harsh weather conditions. Test results are therefore questionable at best.					
IMPACT IF NOT PROVIDED: Testing for icing conditions will continue to be performed at outdoor, sea level facilities, providing inaccurate data on simulated flight conditions. Development of advanced engine technology which must perform at faster speeds and higher altitudes may be jeopardized. Critical data on the performance of existing aircraft may not be obtained.					
ADDITIONAL: DOD 7110-1-M authorizes the use of RDT&E funds to support					

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1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		01 OCT 1992
3. INSTALLATION AND LOCATION		
ARNOLD AIR FORCE BASE, TENNESSEE		
4. PROJECT TITLE		5. PROJECT NUMBER
INSTALL AEROPROPULSION SYSTEMS TEST FACILITY ICING SYSTEM PH3		ANZY940067P3
<p>RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
AIR FORCE					
3. INSTALLATION AND LOCATION EDWARDS AIR FORCE BASE, CALIFORNIA			4. PROJECT TITLE INSTALL WEAPONS SYSTEMS COMPUTER EQUIPMENT		
5. PROGRAM ELEMENT 6.58.07 F	6. CATEGORY CODE 310-916	7. PROJECT NUMBER FSPM942534	8. PROJECT COST(\$000) 755.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL WEAPONS SYSTEMS COMPUTER EQUIPMENT		LS			686.4
SECONDARY UTILITIES		LS			(165.0)
NON-STRUCTURAL MODIFICATIONS		LS			(97.0)
PRE-FABRICATED PARTITIONS		LS			(12.0)
AIR CONDITIONING		LS			(298.0)
RAISED FLOORING		LS			(114.4)
SUBTOTAL					686.4
CONTINGENCY (10%)					68.6
TOTAL CONTRACT COST					755.0
TOTAL FUNDED COST					755.0
UNINTERRUPTABLE POWER SUPPLY					51.0
TOTAL COST					806.0
10. Description of Proposed Construction: Remove non-load bearing interior walls and existing HVAC system. Install secondary electrical service, raised flooring, pre-fabricated partitions, computer cooling, and all work required for a complete and useable facility.					
11. REQUIREMENT: As required. PROJECT: Modify Bldg 1881A to install Weapons Systems Computer Equipment. REQUIREMENT: On-going and future test forces require a local computer facility for data reduction and quick-look functions. This facility must be capable of supporting a variety of data processing and computer resources, such as those required for F-22, Advanced Tactical Fighter. Facility must provide adequate electrical power and cooling for state-of-the-art computers. CURRENT SITUATION: Existing facility does not provide adequate electrical, cooling, and interior configuration required for state-of-the-art computer resources. Originally constructed in 1958, building systems were not designed to provide clean/stable electrical service and minimum temperature and humidity control. IMPACT IF NOT PROVIDED: State-of-the-art weapons systems will not have sufficient distributed computing resources to provide timely data reduction and quick-look for on-going test programs, increasing time and expense during costly fly-test-fly cycles. Weapons systems testing and development will be delayed, resulting in hidden costs to the Air Force. ADDITIONAL: DoD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".					

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO			4. PROJECT TITLE INSTALL VENTILATION FOR AIRCRAFT MODIFICATION FACILITY		
5. PROGRAM ELEMENT 6.58.07 F	6. CATEGORY CODE 211-152	7. PROJECT NUMBER ZHTV942200	8. PROJECT COST(\$000) 600.1		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
INSTALL VENTILATION FOR AIRCRAFT MODIFICATION FACILITY		LS			545.5
VENTILATION SYSTEM		LS			(540.5)
DEMOLITION		LS			(5.0)
SUBTOTAL					545.5
CONTINGENCY (10%)					54.6
TOTAL CONTRACT COST					600.1
TOTAL FUNDED COST					600.1
DESIGN COST					36.0
TOTAL COST					636.1
"This facility is government operated."					
10. Description of Proposed Construction: Install a state-of-the-art ventilation/exhaust system, to include air handlers, ducting, controls, electrical wiring, and demolition work.					
11. REQUIREMENT: As required. PROJECT: Install a ventilation/exhaust system in Bldg 5, 4950th Test Wing Aircraft Modification Facility. REQUIREMENT: A technically advanced and extensively equipped fabrication facility is required to support R&D and prototype development efforts for Aeronautical Systems Center, Air Mobility Command, Air Combat Command, NASA, and other government and non-government agencies. These agencies require quick response and precision manufacturing of a variety of unique test articles and prototype equipment. Facility must contain the latest and most sophisticated equipment available to test and integrate advanced technology and equipment into the Air Force and DoD inventory. Precision manufacturing and computer controlled equipment require controlled environments. This facility must also comply with local and federal environmental and safety regulations. CURRENT SITUATION: The present ventilation system is inadequate, causing temperature increases that exceed operator and equipment tolerances. Workers must be given frequent breaks which resulted in the loss of over 600 man-hours from 18-23 July 1991. Dramatic improvements in industrial machinery processes is creating increases in customer demands for this technological support. These demands have directly impacted the wear and tear on the ventilation system. Increasing OSHA standards, deteriorating environmental conditions, and stringent equipment operating specifications mandate this equipment be upgraded immediately. IMPACT IF NOT PROVIDED: Productivity will continue to decline because of					

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3. INSTALLATION AND LOCATION WRIGHT-PATTERSON AIR FORCE BASE, OHIO		
4. PROJECT TITLE INSTALL VENTILATION FOR AIRCRAFT MODIFICATION FACILITY	5. PROJECT NUMBER ZHTV942200	
<p>unacceptable working conditions. Excessive temperature increases will cause malfunctions which will make it impossible to hold precision tolerances. Potentially dangerous environmental conditions could lead to accidents and injuries.</p> <p><u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support R&D equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>		

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1. COMPONENT AIR FORCE		FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE 01 OCT 1992	
3. INSTALLATION AND LOCATION ARNOLD AIR FORCE BASE, TENNESSEE			4. PROJECT TITLE MODIFY HYPERSONIC/SUPERSONIC WIND TUNNEL CONTROL ROOMS PH 2		
5. PROGRAM ELEMENT VARIOUS	6. CATEGORY CODE 311-115	7. PROJECT NUMBER ANZY933008P2	8. PROJECT COST (\$000) 2,200.0		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
MODIFY HYPERSONIC/SUPERSONIC WIND TUNNEL CONTROL ROOMS		LS			2,000.0
NON-STRUCTURAL MODIFICATIONS		LS			(1,595.0)
HVAC		LS			(105.0)
SECONDARY UTILITIES		LS			(300.0)
SUBTOTAL					2,000.0
CONTINGENCY (10%)					200.0
TOTAL CONTRACT COST					2,200.0
TOTAL FUNDED COST					2,200.0
RDT&E EQUIPMENT					1,600.0
TOTAL COST					3,800.0
TOTAL OBLIGATION AUTHORITY (\$000)					
FY92	FY93	FY94	FY95		
0	200	3800	2000		
"This facility is government operated."					
10. Description of Proposed Construction: Relocate/install partitions, modify security alarm system, modify fire suppression system, install conduits, adjust HVAC system, install raised flooring, and all necessary secondary utility work.					
11. REQUIREMENT: As required. PROJECT: Modify Hypersonic/Supersonic Wind Tunnel Control Rooms in Bldg 676. REQUIREMENT: Two centralized control rooms are required to conduct aerodynamic wind tunnel testing for one supersonic and two hypersonic test units, known as Tunnels A, B, and C. All model attitude controls, model support system actuation, video systems, health monitoring devices, data acquisition and production, and attendant wiring systems must be provided in two consolidated areas in order to effectively control each test. Facility must provide security barriers and alarms systems which would permit the use of more than one test unit during classified testing. Data room and computer room must allow for the interaction with data, displays, communication with the test team, and coordination of the tests, increasing efficiency and production. CURRENT SITUATION: The Hypersonic/Supersonic Wind Tunnel Facility contains three separate control rooms, one for each tunnel. Each room is similar in size, function and operation, and contains common equipment such as minicomputers, printers, plotters, facility computers, and test support hardware. Since there is only one government crew available to operate these tunnels, tests can only be performed one at a time. This severely restricts testing during periods when several DoD programs are being developed. In addition, there is only one data analysis room, located in control room "A". When the government is performing classified					

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1. COMPONENT	FY 1994 RDT&E FACILITY PROJECT DATA (computer generated)		2. DATE
AIR FORCE			01 OCT 1994
3. INSTALLATION AND LOCATION			
ARNOLD AIR FORCE BASE, TENNESSEE			
4. PROJECT TITLE		5. PROJECT NUMBER	
MODIFY HYPERSONIC/SUPERSONIC WIND TUNNEL CONTROL ROOMS PH 2		AN6Y933008P2	
<p>work, unclassified data analysis being conducted by contractor personnel must be ceased, subsequently reducing user occupancy hours. Noise in the control rooms and lack of automation leads to confusion and inefficiency.</p> <p><u>IMPACT IF NOT PROVIDED:</u> Test units A, B, and C will continue to operate inefficiently. User occupancy hours will continue to be limited, possibly delaying development of major DoD programs, such as the NASP, SDI, and SRAM II. Security of weapons systems data could be compromised.</p> <p><u>ADDITIONAL:</u> DOD 7110-1-M authorizes the use of RDT&E funds to support RDT&E equipment in existing facilities. There is no criteria/scope for this project in Part II of Military Handbook 1190, "Facility Planning and Design Guide".</p>			

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